2019

1. **Date** : 9 January 2019
   Presenter : Prapeed Mandapaka
   Theme : Characterizing the changes in rainfall extremes and urbanization in Southeast Asia: Implications for flood risk assessment

Abstract

Urban areas are more vulnerable to extreme events such as floods because of dense population and concentration of critical infrastructure. The January 2013 floods in Jakarta and the December 2014 floods in Peninsular Malaysia are some recent examples, which resulted in extensive property damage and fatalities. Understanding the variability of extreme events, and characterizing the changes in exposure and vulnerability of communities to such hazards are essential to plan disaster management strategies, and to adapt to the changing risk.

In this talk, I will present findings from recent/on-going studies at ICRM on rainfall extremes, associated large-scale atmospheric conditions, and urban growth patterns in Southeast Asia. First, the trends in historical rainfall extremes as derived from rain gauge data will be presented. A physical interpretation for the observed trends will be provided by examining the dynamic and thermodynamic variables over the region. Next, it will be shown through analysis of 0.25°-resolution statistically downscaled rainfall projections (from the NASA Earth Exchange) that many regions in Southeast Asia face increased extreme rainfall by the end of the twenty-first century, thus increasing the region's flood risk. A framework to quantify the regional to local scale dynamics of urbanization using remotely sensed observations and other ancillary gridded datasets will be described. Lastly, projected changes in rainfall in urban regions and low-lying coastal zones in SEA will be discussed to gain better understanding of risk due to changing climate.

Bio

Dr Pradeep Mandapaka is a senior research fellow in the Institute of Catastrophe Risk Management, Nanyang Technological University (NTU). Before joining NTU, he was a postdoctoral scientist in the Federal Office of Meteorology and Climatology Switzerland, where he worked on the European Union FP7 project on precipitation nowcasting and flash floods. His research interests include hydrometeorology, impacts of climate change and urbanisation on hydrologic extremes, and flood risk assessment. He holds a PhD in Civil and Environmental Engineering from the University of Iowa, and a Master's degree in Satellite Technology and Applications from the Indian Institute of Science, Bangalore.

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2. **Date** : 16 January 2019
   Presenter : Joshua Lee (CCRS)
   Theme : The links between the Madden-Julian Oscillation and European weather regimes.

Abstract
The Grosswetterlagen (GWL) is a useful set of 29 weather regimes which describe the synoptic-scale flow patterns over the North Atlantic and Europe (NAE). In this study we show how these can be modulated by teleconnection from the Madden-Julian Oscillation (MJO). We match the GWL to 4 classical weather regimes (NAE-CWRs) that capture the large-scale flow characteristics over the NAE region and are useful for relating the GWL teleconnections to previous studies. Finer teleconnection details are revealed in the GWL over the NAE-CWRs, related to the modulation of climatological transitions between GWL regimes and persistence of GWL regimes by the MJO.

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3. **Date** : 21 January 2019
Presenter : Ying-Hua (Bill) Kuo, Bill Schreiner and Jan Weiss, (UCAR)
Theme : Introduction to GNSS Radio Occultation and Reflection Retrieval Processing and Science Applications at UCAR

Abstract
We present an overview of UCAR's background and capabilities in the areas of GNSS radio occultation (RO) and reflection retrieval processing and science applications. The COSMIC Program has been involved in GPS/GNSS radio occultation since the GPS/MET program (1995-1997), and is a significant contributor to the design, build, operations, and science or the COSMIC-1 (2006-present) and COSMIC-2 (planned launch 2019) missions. The COSMIC Data Analysis and Archive Center processes a variety of missions of opportunity and makes data, neutral atmosphere, and space weather products available to operational and research users. Our RO science application research spans weather, space weather, and climate. We highlight recent results on RO data assimilation for numerical weather prediction, typhoon genesis, and ionosphere characterization from ground- and space-based observations. In the area of GNSS reflections, we give an overview of our support of NASA's CYGNSS mission, recent science results mapping water and soil inundation, and development of a next-generation reflections receiver.

Bio

Bill Kuo

Dr. Bill Kuo is the Director of UCAR Community Programs. The University Corporation for Atmospheric Research (UCAR) is a non-profit consortium of more than 100 North American member colleges and universities focused on research and training in the atmospheric and related Earth System Sciences. UCAR Community Programs provide education, training, data and science support services to the broad Earth science community.

Bill started his career as a NCAR scientist working on mesoscale meteorological modeling and was responsible for the development of the 4th and 5th generation of the mesoscale model MM4 and MM5, as well as a major contributor to the development of the WRF model and its data assimilation systems. Bill served as the Director of the Developmental Testbed Center (DTC) from 2009 to 2018. From 1997 through 2015, He served as the Director of the UCAR COSMIC Program. COSMIC was the world's first GPS radio occultation satellite constellation, which provides critical

observations to support atmospheric research and operational weather prediction. Bill has also served as the NCAR advisor and mentor for numerous graduate students, and postdoctoral fellows. He has published over 180 journal papers, as well as numerous conference articles and reports. His scientific interests include hurricanes, extratropical cyclones, mesoscale convective systems, heavy rainfall prediction, data assimilation, and GPS atmospheric remote sensing and their research applications.

Bill Schreiner

Dr. Bill Schreiner is currently Director of the UCAR COSMIC Program where his primary responsibilities include the successful operation of the COSMIC-1 GPS radio occultation (RO) mission, providing support to NOAA and USAF for the successful execution of the COSMIC-2 mission, overseeing the program's scientific research, and managing the program's personnel and budget. His scientific interests include: geodesy, precise GPS data processing, satellite orbit determination, and remote sensing of the neutral atmosphere and ionosphere with the radio occultation technique. Dr. Schreiner has over 25 years experience in GNSS processing with an emphasis on orbit/clock determination and GNSS RO retrieval and science applications. He received his Ph.D. in Aerospace Engineering Sciences from the University of Colorado.

Jan Weiss

Dr. Jan ("Yan") Weiss is Manager of the COSMIC Data Analysis and Archive Center (CDAAC) at the University Corporation for Atmospheric Research in Boulder, Colorado. The CDAAC processes GNSS radio occultation data from a variety of satellite missions to produce atmospheric and space weather products for operational and research applications. His research focuses on precise orbit and clock determination as well as geodetic applications of GNSS. Previously, at the Jet Propulsion Laboratory, he was as an analyst and developer for a variety of real-time and post-processed GNSS systems. He received his Ph.D. in Aerospace Engineering Sciences from the University of Colorado.

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4. **Date** : 30 January 2019
Presenter : Lee Shao-Yi (Department of Atmospheric Sciences, Sun Yat-Sen University)
Theme : A variable-resolution forecast system for the South China Sea

Abstract
In this talk I present the variable-resolution forecast system that is being developed jointly by Sun Yat-Sen University, China and University of Massachusetts Darthmouth, USA. I will describe the foundation work done in Singapore, the forecast system's current incarnation, the experimental forecasts carried this summer, and the future direction of the forecast system.

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5. **Date** : 13 February 2019
Presenter : Thea Turkington (CCRS)
Theme : Looking back at the S2S and S2D conferences in 2018

Abstract

This presentation covers highlights from the International Conferences on Subseasonal to Decadal Predictions, held in Boulder in September 2018. The presentations on both the subseasonal to seasonal (S2S) and seasonal to decadal (S2D) were quite extensive, from model related issues to end-user interactions and product development. Five different topics from the conference will be addressed:

1. Updates from the S2S modelling community;
2. MJO;
3. ENSO;
4. Decadal predictions;
5. End-users and product development

These topics represent those that may be of interest to MSS, as well as some of the more controversial talking points. The presentation will also introduce the second phase of the S2S Prediction Project, and ways in which MSS can be involved.

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6. **Date** : 20 February 2019

Presenter : Li Ruimin (Tropical Marine Science Institute, NUS)

Theme : Comparison and evaluation of the impacts of anthropogenic sulphate aerosols on precipitation and intensity of tropical cyclones

Abstract

The effects of anthropogenic aerosols on the intensity and precipitation of tropical cyclones varied across different cyclones systems. To understand the possible mechanisms of the diverse effects of aerosols, we investigated the effect of anthropogenic sulphate aerosols on intensity and precipitation of two different tropical cyclones, namely Haiyan and Vamei, with numerical simulations. The results of the numerical simulations show that anthropogenic sulphate aerosols have opposite effects on the precipitation of the two cyclones. The presence of aerosols enhances precipitation in Haiyan but reduces precipitation in Vamei. The opposite responses of precipitation to the atmospheric loading of aerosols were attributed to the different vertical distribution of water vapour within the two simulated cyclones. Additionally, the modeling results also reveal that increasing aerosol concentration would enhance the wind intensity of Haiyan that features a well-organized eye and an axisymmetric structure. However, the wind intensity of Vamei is insensitive to the aerosol perturbations. This finding suggests that the presence of anthropogenic sulphate aerosols might enhance strong tropical cyclones but do not affect the intensity of the weak cyclones.

Bio

Ruimin is a recent Ph.D. graduate from the National University of Singapore. Her research interest includes climate change, numerical weather prediction and the role of aerosols in the climate and environment. During her doctoral study, she used statistical and dynamical methods to investigate the impacts of atmospheric aerosols on regional precipitation and tropical cyclones.

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7. Date : 27 February 2019
Presenter : Hans Huang (CCRS)
Theme : Blending of Global and Regional Analyses/Forecasts with a Spatial Filter

Abstract

For regional NWP systems, observations outside the model domain are not assimilated and cannot have an impact on the analysis inside the model domain. This can lead to an inferior analysis near the model lateral boundaries and at larger horizontal scales compared to the global analyses. Models over limited area domains also have difficulties handling the large-scale, in particular, the scales comparable to the model domain or larger. Partial cycling and cold start have been used in some regional NWP systems to ingest the missing large-scale information in the initial condition but they are computationally expensive or suffer from spin-up problems. The spatial blending of the large scales from global analyses/forecasts with the smaller scales from regional analyses/forecasts has been tried previously to alleviate the problems mentioned above. Some blending applications can be found in Yang (2005a; 2005b), Wang et. al. (2014) and Hsiao et. al. (2015). In this talk, I will give an introduction to the blending method and some initial experiments we performed with SINGV.

References

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8. Date : 27 February 2019
Presenter : Anny Cazenave (LEGOS, Toulouse, France & ISSI, Bern, Switzerland)
Theme : Climate change, ocean warming, land ice melt and sea level rise

Abstract

It is now well established that the Earth‘s climate is warming and that the main reason is the accumulation inside the atmosphere of greenhouse gases produced by anthropogenic fossil fuel combustion and change in land use. Global warming has already several visible consequences, in particular increase of the Earth’s mean temperature and of ocean heat content, melting of glaciers, and ice mass loss from the Greenland and Antarctica ice sheets. Ocean warming causes thermal expansion of sea waters, hence sea level rise. Similarly, land ice melt that ultimately reaches the oceans, also causes sea level to rise. In this presentation, we summarize the most up-to-date knowledge about climate change and associated impacts on ocean warming, land ice melt and sea level rise. We highlight the contribution of space data, in particular satellite altimetry and space gravimetry, to measure ice sheet mass loss and sea level rise. We also discuss the various

causes of sea level rise at global and regional scales and show that in terms of global average, we are now able to close the sea level budget. Finally, we discuss the importance of measuring sea level change at the coast, as well as the many complex processes at work in such regions (due to natural phenomena and anthropogenic forcing) that cause important adverse effects and significant vulnerability.

Bio

Anny Cazenave is senior scientist at the 'Laboratoire d'Etudes en Géophysique et Océanographie Spatiale', 'Centre National d'Etudes Spatiales', Toulouse, France, and director for Earth sciences at the International Space Science Institute/ISSI, Bern, Switzerland. Her research deals with the applications of space techniques to geosciences (geodesy, gravity and solid Earth geophysics; sea level variations from satellite altimetry and study of climatic causes; global water cycle and land hydrology from space; climate research). She published 250 articles in international journals and edited several books. She contributed as P.I. or co-I in several space missions in geodesy and oceanography. She served in several national and international scientific committees (e.g., World Climate Research Programme/WCRP, "Future Earth", European Research Council/ERC Advanced Grants, US National Research Council/NRC), and was lead author of the IPCC (Intergovernmental Panel on Climate Change) Working Group I (4th and 5th Assessment reports). She is Fellow of the American Geophysical Union and the American Association for the Advancement of Science. She is member of the French Academy of sciences and foreign member of the American, Indian and Belgium academies of sciences.

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9. Date : 6 March 2019

Presenter : Muhammad Omer (Cooling Singapore/Eco System Services Projects, Future Cities Laboratory, Singapore ETH Center)

Theme : Multilayer urban climate modelling of a tropical city using local climate zones

Abstract

Mitigation and adaption measures have to be designed strategically by urban planners, designers, and decision-makers to reduce Urban Heat Island (UHI) related risks. In this research, the Weather Research and Forecasting (WRF) model coupled with the multilayer urban canopy model was employed to assist in designing UHI mitigation scenarios for the tropical city of Singapore, with a focus on an extremely hot month of April 2016. The local climate zone for Singapore was used as the land use/land cover data to account for the intra-urban variability. The simulations show that the Singapore's canopy layer UHI intensity can reach up to 5 ºC in compact areas during nighttime. The results reveal that the city scale deployment of cool roofs can provide an overall reduction of 1.3 ºC in the near surface air temperature in large low rise areas. Increasing the thermostat set temperature to 25 ºC from 21 ºC in city wide buildings can potentially reduce the air temperature (by 0.36 ºC during early morning in compact high rise areas) due to less (~20 % less) waste heat discharge from air-conditioning units. Furthermore, it provides ~0.2 ºC reduction in the peak UHI intensity especially in the compact high rise dwellings. A densification scenario considering leads to a general air temperature increase of 1.4 ºC, which demonstrates the importance of limiting the densification of less compact areas in maintaining thermal comfort in the future.

Bio

Omer did his PhD in Applied physics at Curtin University Australia with emphasis on wind prediction, modelling and validation. He developed a novel technique to couple meso and micro scale models for improved wind prediction. He modified the modelling technique to understand and predict the Urban Heat Island phenomenon for the tropical city of Singapore. He improved the coupling technique to study wind ventilation paths in a microscale. He has published relevant publications in quality Journals and esteemed conferences around the world. His background is in Mechanical Engineering with six years of professional experience in research and development.

Omer is greatly interested in computational fluid dynamics focussing on providing solutions for ameliorating the human environment and comfort. As such his work further relates providing mitigation strategies to counteract the urban heat island effect in the tropics. He likes engaging fluid dynamics, engineering design and energy forecasting skills for this purpose.

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10. Date : 13 March 2019
Presenter : Tan Wee Leng (CCRS)
Theme : Evaluation of Sub-Seasonal Forecasts of Weekly Number of Dry Days with ECMWF Extended Range Forecast

Abstract

Weather and climate extreme events are of major concern for countries in Southeast Asia, with hydro-meteorological events making up a total of 85% of disasters in 2017. Through interactions with agricultural and the water management sector, sub-seasonal to seasonal forecasts of the number of dry days (NDD) were thought to be highly useful in preparation for management of low rainfall conditions.

Assessment of the ECMWF S2S forecast skill for number of dry days in a week was made. Correlation of anomalies (CORA) and mean-square skill score (MSSS) on the weekly NDD were calculated using 11 ensemble members hindcast data for the year 1998 to 2014, compared to observations data from Tropical Rainfall Measuring Mission (TRMM 3B42 v7). Adaptive threshold based on the 20th percentile from the distribution of the hindcast daily precipitation data was used. Skill scores were calculated for four lead times (a lead time of 1 week to a lead time of 4 weeks). The skill scores showed good skill for weeks 1 and 2 in Southeast Asia, with some skill in NDD up to a lead time of 4 weeks, and also supported by case studies. It is proposed that the ECMWF S2S forecast can be used for providing forecast on the weekly number of dry days at the subseasonal timescale.

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11. Date : 4 April 2019
Presenter : Jon Petch (UK Met Office)
Theme : The Unified Model Partnership and Regional Model Development

Abstract

I will present why the Unified Model Partnership is key for its partners for delivering their services and then discuss how it works. I will then discuss the challenges and priorities for the development of regional forecasting systems and specifically those for the kilometre-grid scale Unified Model. Developments in the coming years include a new multi-modal cloud scheme, a new flexible microphysics scheme and a scheme to represent sub-grid convection.

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12. Date : 24 April 2019

Presenter : Mathew England (Climate Change Research Centre, UNSW, and Centre of Excellence for Climate Extremes, Australia)

Theme : Role of Pacific trade wind variations in decadal climate variability and ocean heat uptake

Abstract

The role of Pacific trade wind variations in driving global climate and ocean heat uptake is examined using a high-resolution ocean model. In the main perturbation experiment, atmospheric trends as observed in the Pacific sector (1992-2011) are applied, while the rest of the ocean is forced by CORE normal year fluxes. The 1992-2011 period was characterized by a marked acceleration of the Walker circulation and trade winds, and a trend toward a negative phase of the Interdecadal Pacific Oscillation (IPO). In response we find a strengthening of the tropical Ekman divergence and Equatorial Undercurrent (EUC), which brings cool water to the surface of the eastern Pacific, and an increase in the Pacific shallow overturning cells, in turn subducting heat into the western Pacific. The wind acceleration also results in an increase in the Indonesian throughflow (ITF), taking anomalous heat from the warm subsurface western Pacific into the Indian Ocean. Despite east Pacific cooling, there is an overall increase in net Indo-Pacific heat content. A 20-year future scenario experiment is then examined, applying a symmetric reversal of the atmospheric fields to mimic a return to the neutral phase of the IPO. In response we find a slowdown of the EUC, the ITF and the Pacific overturning cells, and a return to climatological SST conditions in the Pacific. However, the ocean heat content response is not symmetric due to an overall increase in the surface heat flux into the ocean associated with the decades-long reduced SSTs in the east Pacific, and also due to irreversible heat transfer from the Pacific into the Indian Ocean via the ITF. There is also irreversible heat transport across the thermocline via diapycnal mixing, further contributing to the asymmetric response, with the Indo-Pacific subsurface remaining warmer than it was in its initial state. This could have implications for long-term heat content changes in the ocean interior.

Short blurb for a general audience

In this talk I explore how multi-decadal variations in the Pacific Walker circulation and trade winds can impact circulation and heat content anomalies in the Indian and Pacific Oceans. Significant redistributions of ocean heat content can result from these wind variations. The controlling mechanisms and the fate of subducted heat content anomalies are explored in both trade wind acceleration and trade wind deceleration experiments.

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13. Date : 8 May 2019

Presenter : Joshua Qian (CCRS)

Theme : On the Vanguard and Lingering Patterns of Rainfall Variability in the Maritime Continent Associated with the Madden-Julian Oscillation

Abstract

Before the eastward propagating rainy envelope of a Madden-Julian Oscillation (MJO) arrives at the Maritime Continent (MC), some areas within the MC experience opposite signs of rainfall anomalies. Similar incoherent rainfall anomalies are also observed after the MJO passed the MC. The mechanisms for these vanguard and lingering patterns of rainfall anomalies in the MC are investigated by using observed and reanalysis data. It is found that the response of rainfall in the MC depends on the direction of wind anomalies and the availability of atmospheric moisture in different phases of the MJO. The low-level wind anomalies over the MC are easterlies in MJO Phases 1-3, which cause above normal rainfall over the mountainous areas in Java, and in western Borneo, western Sumatra, and western Malay Peninsula, respectively. In Phases 5-6, the low-level wind anomalies are westerlies and the positive rainfall anomalies are over the eastern part of the islands. Two physical mechanisms are responsible for this phenomenon of the dipolar patterns of rainfall anomalies:

1) the monsoonal damping effect on rainfall over elongated narrow islands – an inverse relationship between the intensity of the diurnal cycle of sea breezes and the large-scale monsoonal wind speed; and

2) the wake effect on rainfall over large and wide islands—more rainfall on the wake side of an island or mountain range in respect to large-scale wind anomalies.

The impact of the MJO on rainfall in the MC depends on the local geography of islands, the seasonal mean climate in the region and the wind anomalies in each phase of the MJO.

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14. Date : 15 May 2019

Presenter : Prof Liong Shie-Yui (Deputy Director, Tropical Marine Science Institute, National University of Singapore)

Theme : Overcoming Lack of Data in Flood Hazard Assessment: Cost-Effective High Quality DEM and Rainfall Proxy

Abstract

Flooding is known as one of the most devastating and costly catastrophes that disrupt transport and communication, and cause human, property and economy losses. Many urban cities in Southeast Asia have witnessed a series of severe flooding issues in recent decades. They are mainly due to rapid urbanization, poor urban planning and drainage design, and increasing rainfall extremes with changing climate. One of the challenges faced by developing countries is insufficient good quality data essential for flood model simulations, risk assessments and mitigation measures. This talk shares simple and yet novel approaches to overcome the lack of data, specifically Digital Elevation Model (DEM) and rainfall data. The effectiveness and accuracy of the proposed approaches, and their application to a large catchment will be demonstrated.

Obtaining DEM through surveys is known to be time consuming and very costly. Since 2015, DEM from Shuttle Radar Topography Mission (SRTM) of 30m resolution is publicly accessible. This eases

partially the DEM issue. Question still remains whether it can be used, without further treatment, reliably. An approach, using Artificial Neural Network (ANN), to improve the SRTM DEM is suggested and its accuracy is demonstrated in this study. SRTM DEM and Sentinel-2 multispectral imagery are used as the input data of the ANN; a high quality surveyed DEM is used as ANN's target layer. Training and validation of ANN consistently show significant improvement of SRTM DEM in Nice (France) and in Singapore.

Precipitation data record is often not available and/or not sufficiently long to derive meaningful Intensity-Duration-Frequency (IDF) curves essential in drainage designs. This talk again shares the use of rainfall proxies resulting from a high resolution regional climate model (RCM) driven by Re-Analysis data such as ERAI. Weather Research and Forecasting (WRF), an RCM, driven by ERAI is used in this study for Southeast Asia domain. Its simulated rainfall data is extracted to construct the IDF curves of Singapore; these IDF curves are then compared with the IDF curves, derived from rainfall data from 35 raingauge stations, publicly accessible Code of Practice on Surface Water Drainage (https://www.pub.gov.sg/Documents/COP_Final.pdf). The comparison show quite good match. This gives confidence in selecting rainfall data from RCM as proxies for places where good quality extreme rainfall record is in question.

The talk concludes with the application of the above proposed approaches, obtaining high resolution DEM and IDF curves, on Jakarta, Indonesia. Flood simulations for various return periods are conducted and flood maps are presented. Results are useful for flood hazard assessments which in turn lead to more informed policy making for flood mitigation measures.

Keywords
Artificial Neural Network, DEM, Climate Change, Flood Hazard, Remote Sensing

Bio
44Dr. Liong has been with Tropical Marine Science Institute of National University of Singapore (NUS) since 2004 after spending about 20 years (lecture, research) with the Department of Civil and Environmental Engineering of NUS. He received his Dipl.-Ing. and Ph.D degrees from University of Karlsruhe (Germany) and Iowa Institute of Hydraulics Research of University of Iowa (USA) respectively.

Dr. Liong's most recent research focus is on climate downscaling for Southeast Asia domain and deriving valuable information from the downscaled climate to evaluate the impacts of climate change on water resources, flooding, drought, crop yields, etc. He has been commissioned twice, consecutively, by the government of Singapore (NEA, and BCA) to undertake climate change studies (Vulnerability Study, 2007 – 2009, main Principal Investigator; Risk Map Study, 2010- 2014, Co-PI).

He is currently an editor of Journal of Environmental Science and Policy and was an editor of Journal of Hydroinformatics. He was the President of Hydrological Science Section of AOGS (2008-2010), and Chairman of Joint IAHR-IWA-IAHS Hydroinfomatics Committee (2009-2012). He is a Council member of Asia Water Council.

Dr. Liong is a 3-time recipient of the Best Paper Award of IAHR-APD Congress (1994, 2002 and 2012. In 2007 he was awarded by the President of Federal Republic of Germany the Order of Merit ("Bundesverdienstkreuz"). He has been invited to give various talks. The most recent ones are (1) Distinguished Lecture at 10th Asia-Oceania Geosciences Society meeting in Brisbane, Australia (2013), (2) Plenary Talk at the 10th Hydroinformatics Conference, New York City, USA (2014), (3) Keynote at the 21st Congress of IAHR-APD (International Association for Hydro-Environment Engineering and Research, Asia Pacific Division) in Yogyakarta, Indonesia (2018), and (4) keynote at the upcoming 1st Regional Conference on Environmental Modeling and Software (Asian Region), Nanjing, China (2019).

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15. Date : 24 May 2019
Presenter : Brue Ingbely (ECMWF)
Theme : Radiosondes and NWP

Abstract

A brief introduction will be given on radiosondes which covers the measurement techniques, processing and their uncertainties.

About 40% of radiosonde stations now provide high vertical resolution reports in BUFR format along with the position of each level. Accounting for the radiosonde drift in NWP systems improves the upper level fit between radiosondes and model fields. Radiosonde descent data (after balloon burst) looks useful but will need extra quality control.

ECMWF observation-minus-background statistics show some variations in quality between different radiosonde types and also clear variations with latitude. Larger differences in the tropical stratosphere are probably related to gravity wave activity. Changes based on some of these issues have helped to improve ECMWF's analyses and forecasts.

Bio

From 1984 to 2013 Bruce worked at the UK Meteorological Office, mainly on different aspects of atmospheric data assimilation but including 5 years on ocean assimilation for seasonal forecasting. Since late 2013 Bruce has worked at ECMWF on assimilation of in situ observations, partly for external contracts (use and impact of aircraft humidity data, the quality and use of different radiosonde types, and impact of buoy pressure data) and also on improvements to the ECMWF assimilation/forecast system.

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16. Date : 31 May 2019
Presenter 1 : Caroline Bouvet de Maisonneuve (Asian School of Environment & Earth Observatory of Singapore, NTU)
Theme : Improving our understanding of Southeast Asian volcanic eruption histories, with an emphasis on Sumatra (Indonesia)

Abstract
Improving our knowledge of volcanic eruption histories in Southeast Asia is important for regional hazards. Southeast Asia hosts ~750 volcanoes and is home to a population of ~600 Million. In Indonesia, for example, ~30% of the population lives within 30 km from a Holocene volcano. Another important factor is that large volcanic eruptions from Southeast Asian volcanoes have particularly global impacts on climate because they occur in equatorial to tropical regions, releasing ash and aerosols that propagate into both hemispheres.

143 volcanoes in Southeast Asia have been classified as Large Calderas and Well-Plugged Stratocones by Whelley & al (2015) and thus have or are likely to have produced large explosive eruptions. Only 26 such eruptions have known ages, spanning from 1.2 Ma to 1991 AD. Fewer have geochemical data that can be used for correlations. The Young (75 ka) and Old (~800 ka) Toba Tuffs are frequently used as tephrochronological markers. However, a closer look at Sumatra reveals other large caldera-forming eruptions with potentially similar ages. Determining the age and geochemical characteristics of unstudied calderas will greatly enhance our understanding of the frequencies of such events and enable solid correlations with tephra layers found in distal locations.

Presenter 2 : Susanna Jenkins (Asian School of Environment & Earth Observatory of Singapore, NTU)
Theme : Consequence-Driven Risk Framework for Uncovering Black Swans Events: Volcanic Ash in Singapore

Abstract
Both deterministic and probabilistic risk modelling techniques can inadvertently over-constrain sensitive variables, rendering some high-consequence events impossible within the framework of those models. As part of an NRF funded project investigating the risk from natural 'Black Swan' events in Singapore, we apply a consequence-driven framework to re-consider past events through the lens of counterfactual analysis. Counterfactual analysis varies the circumstances of a past event, within credible bounds, in order to consider an alternate version of the event. This offers a dynamic representation of history, one from which lessons-learned are no longer limited by a single realisation of history. Here, we will illustrate our consequence-driven framework for the case study of airspace closure in and around Singapore due to volcanic ash. The Mt. Pinatubo eruption of 1991 sent ash over 2,400 km from the Philippines to Singapore causing noticeable changes in air quality in Singapore, and engine problems for commercial aircraft near Singapore. Changi remained operational throughout the event. We explore whether this event would have been more or less consequential for Singapore under slightly different circumstances, all of which are scientifically credible. The framework will also be used to consider the risk for Singapore from other natural hazards such as earthquakes and tropical storms.

Presenter 3 : Benoit Taisne (Earth Observatory of Singapore & Asian School of Environment, NTU)
Theme : Near Real Time Remote Characterisation of Explosive Eruptions for Mitigation of Impacts and Loss in SE Asia

Abstract

I will present a new research project that aims to develop, expand upon and combine existing technologies to improve the detection, characterisation and understanding of potential impacts from explosive volcanic activity in Southeast Asia, and present information in a timely manner for efficient decision-making. It will focus on rapidly quantifying volcanic ash emissions, by harnessing a multi-technology and multi-disciplinary approach, with the aim to mitigate their short, mid and long term impacts. This project focuses on Southeast Asia where remote ground based or space based monitoring could be challenging (Taisne et al., 2019). For the short term, the project will concentrate on reducing the delay between eruption occurrence and communication of the hazard to the aviation industry. In the mid and long term, the project aims to provide information that can be used for cost-effective and predictive maintenance of jet engines as well as estimating the impact of explosive events on the ground.

Singapore, like many other smart-cities around the globe, is not immune from volcanic threats. While there are no volcanoes located within Singapore, Southeast Asia is one of the most volcanically active regions in the world and is home to 70% of the global volcanic threat. In a recent studies we identify 991 volcanoes with the potential to impact the Association of Southeast Asian Nations (ASEAN) airspace, with a 100% probability of an eruption powerful enough to produce an ash plume to 25 km or higher within any given 10 year period (Whelley et al., 2015). In 1982, a British Airways jet with 240 persons on board encountered an ash cloud at ~11 km height in west Java, Indonesia, that stalled all four of its engines and abraded its windshield and wing surfaces. The aircraft lost 7.5 km of altitude before the engines could be restarted (Global Volcanism Program, 1982). Given the very high temperatures of today's jet engines, it is not clear that an aircraft flying through the same concentration of ash today would have the same fortunate ending. Singapore is susceptible to long-range hazards from volcanic activity via volcanic ash both on the ground (with impacts for critical infrastructure, e.g., power plants and airports) and in the air (e.g., health, aviation industry). After the 1991 eruption of Pinatubo volcano in the Philippines, ash was transported to Singapore and deposited at a thickness that would, with today's criteria, close all airports and likely a large portion of the Flight Information Region (FIR). Any closure of, for example, Changi airport, and the FIR would have significant impacts on Singapore and the region as a whole, as Changi is a major aviation hub for the region. By refining nowcasting and forecasting of volcanic ash dispersal, timely action could be taken to close or open airspace and estimate potential long term damage to aircraft and engines (reducing economical loss by taking informed decisions), give enough lead time to shut down critical infrastructure such as power plants (reducing economical loss by preventing damage to the system) as well as rapidly estimating the potential hazard and impacts of ash on the ground (informing post-disaster needs assessments and mitigating impacts for populations and infrastructure).

References

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Bio

Asst. Prof. Caroline Bouvet de Maisonneuve is a volcanologist with a particular interest for reconstructing eruption histories, magma storage conditions, and eruption mechanisms. Her main research interests are magmatic processes occurring just prior to and during an eruption, identifying processes responsible for changes in eruptive behaviour, and cycles of caldera-forming eruptions. She applies a range of tools, such as textural and chemical characterization of whole-rocks and minerals, melt inclusion analyses, numerical modelling, and tephrostratigraphy. She obtained her Ph.D. from the University of Geneva (Switzerland), and is now an Assistant Professor at the Earth Observatory of Singapore and Asian School of the Environment (Nanyang Technological University, Singapore).

Asst. Prof. Susanna Jenkins is a renowned world expert in studying the impacts of ash on infrastructure (with research funded by AXA, EDF, the World Bank and the United Nations). She also led research on European-scale ash dispersal modelling, and hazard and impact assessment for critical infrastructure, including the development of eruption source parameters where data are lacking, and using of targeted sampling of weather variability to improve the efficiency of probabilistic assessments of volcanic ash dispersion modelling, while still accounting for uncertainties. She obtained her Ph.D. from Macquarie University (Australia), and is now an Assistant Professor at the Earth Observatory of Singapore and Asian School of the Environment (Nanyang Technological University, Singapore).

Asst. Prof Benoit Taisne led a number of undergrad research projects investigating the use of infrasound (ground based remote sensing) and tweets (social media) in detecting volcanic eruptions. In his recent research, he exposed the challenges of space-based and ground-based monitoring of explosive volcanic eruptions, stressing the importance of using multiple, independent sources of information together to refine our understanding of ongoing eruptions. He obtained her Ph.D. from the Institut de Physique du Globe (Paris, France), and is now an Assistant Professor at the Earth Observatory of Singapore and Asian School of the Environment (Nanyang Technological University, Singapore).

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17. Date : 5 June 2019
PUBLIC HOLIDAY

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18. Date : 12 June 2019
NO SEMINAR

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19. Date : 19 June 2019
Presenter : Dr. Svetlana Jevrejeva (CCRS)
Theme : Living with rising seas

Abstract

Fragile coastal ecosystems and increasing concentrations of population and economic activity in maritime cities are reasons why future sea level rise is one of the most damaging aspects of the warming climate. Furthermore, sea level is set to continue to rise for centuries after greenhouse gas emissions concentrations are stabilized due to system inertia and feedback time scales. Impact, risk, adaptation policies, and long-term decision-making in coastal areas depend on regional and local sea level rise projections, and local projections can differ substantially from the global one.

Despite significant progress in the scientific understanding of the physical mechanisms contributing to the global sea level change, coastal sea level projections remain highly uncertain. In my presentation I will focus on the recent developments and challenges in the probabilistic projections of coastal mean sea level rise by 2100.

Short Bio

Dr. Svetlana Jevrejeva is a Physical Oceanographer with expertise in sea level science. For over 17 years she has been working at the National Oceanography Centre, Liverpool, UK. Dr. Jevrejeva is a Lead Author of Ch. 13, Sea Level Change, Working Group 1, IPCC Fifth Assessment Report (AR5). She is a Member of Group of Experts of Global Observing Sea Level System (GLOSS), the Intergovernmental Oceanographic Commission (IOC).

Research interest

Dr. Jevrejeva specialises in the synthesis of observations and models to develop our understanding of physical mechanisms for global and regional sea level rise and variability, their impact in coastal areas, changes in tropical cyclones in warming climate and extreme sea levels. Since 2002 Dr Jevrejeva has published 68 papers (including Science, Nature, PNAS and others) and the success of her research is reflected in more than 10000 citations, h-index 38.

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20. Date : 26 June 2019
Presenter : Erick Becker (CCRS)
Theme : Towards a Radar-Based Nowcasting system for MSS

Abstract

In an operational environment such as a Met Services the end goal for any Nowcasting product derived from weather radar data is to be as accurate and reliable as possible. However, in order to provide clients and the public with reliable nowcasts; data quality and availability is just as important as the nowcasting algorithms/models themselves. It then becomes important to consider the entire data processing value chain, as one “weak link” in the chain can result in undesirable outcomes.

The first part in this chain is the radar observation component which relate to radar calibration and signal processing. The second part deals with data quality control and composite processing of 2 or more radars in an observation network. The third part relates to precipitation estimation before finally nowcasts from these results can be produced.

Some initial results from the aforementioned components in the value chain will be shown in this talk. Highlighting some of the challenges and also discussing recommendation for potential improvement and future studies.

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21. Date : 3 July 2019
Presenter : Dr. Feng Lujia (EOS, NTU)
Theme : Summer intra-seasonal variability of precipitable water revealed by the Sumatran GPS Array in Indonesia

Abstract
Although originally designed for positioning, navigation, and timing, the Global Positioning System (GPS) can be used as a powerful tool for observing the amount of water vapour in an atmospheric column (i.e., precipitable water). Over the past three decades, an exponentially growing number of continuously operating GPS (cGPS) stations have been built for recording tectonic and earthquake deformation; however, the rich trove of information about atmospheric water vapour (AWV) from these stations has yet to be widely investigated.

Using the zenith wet delay data from the Sumatran GPS Array (SuGAr)--a hero network in tectonic and earthquake studies--we conduct a case study for the northern summer of 2008, which was not strongly influenced by either the El Niño-Southern Oscillation (ENSO) or Indian Ocean Dipole (IOD). We show that the summer intra-seasonal variability over Sumatra in a year without strong inter-annual variability is dominated by the Indian monsoon and further influenced by dry-air intrusions due to Rossby waves originating in the Southern Hemisphere. Additionally, our results reveal an intra-seasonal connection between the Indian monsoon and the western North Pacific monsoon. When the Indian monsoon is strong, it pumps AWV over Sumatra and the eastern Indian Ocean to feed into the convection in the western North Pacific monsoon region. Our case study demonstrates the huge potential of regional cGPS networks to unravel large-scale atmospheric processes that govern variability in AWV.

Bio
Dr. FENG Lujia is a Senior Research Fellow at the Earth Observatory of Singapore (EOS), Nanyang Technological University (NTU). She received her B.Sc. in Geology and M.Sc. in Structural Geology from Zhejiang University in China, and her Ph.D. in Geophysics from Georgia Institute of Technology in USA. She is a geodesist who has various experiences in studying earthquake-related, tectonic, and volcanic deformation using GPS. Much of her work has involved analysis and modeling of the deformation signals from the SuGAr. She has recently developed her interest in using the AWV information collected by the SuGAr to study the weather and climate over Southeast Asia.

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22. Date : 10 July 2019

Presenter : Dr. Stefano Galelli (SUTD)

Theme : Understanding the impact of hydro-climatic variability and transmission capacity on the hydropower output of tropical river basins—insights from a case study in Laos

Abstract

During the past decade, Laos has acquired a pivotal role in Southeast Asia's energy landscape. The country has rapidly expanded its hydropower system, which exports most of its electricity production to Thailand and other neighbouring countries. The operation of such complex system is challenged by multiple factors, including environmental constraints, the capacity of the transmission lines, and water availability, which varies on both intra- and inter-annual scale. To understand and quantify the effect of these factors, we developed a coupled water-energy model of the GMS. Hydrological and hydraulic processes are simulated with the VIC (Variable Infiltration Capacity) model, which we modified to account for the operation of all main hydropower reservoirs in the region. With this modification, VIC estimates the effect of rainfall variability and reservoir operation on the available hydropower. The latter is the input of a Network-Constrained Unit Commitment model, which schedules the hourly energy production mix to satisfy national demands at a minimum cost—while considering the operational constraints of the power generation and transmission facilities. Simulation results from a 10-year study period reveal a strong dependency of the energy production mix on the hydro-climatological conditions. During the monsoon months, the energy system largely relies on hydropower production, while during pre-monsoon months, the system relies substantially on fossil fuels, imports, and other renewables. Interestingly, simulation results show that the dispatch of hydropower is constrained by the capacity of the transmission lines, which are severely stressed during the monsoon. This implies that part of the available hydropower may remain unused. These conditions are exacerbated by large-scale climate phenomena, such as the El Niño Southern Oscillation.

Bio

Dr. Stefano Galelli graduated in Environmental and Land Planning Engineering at Politecnico di Milano in 2007 and received a Ph.D. in Information and Communication Technology from the same university in early 2011. Before joining SUTD as Assistant Professor, Dr. Galelli spent two years as Post-Doctoral Research Fellow at the Singapore-Delft Water Alliance (National University of Singapore), where he led the Hydro-informatics research group. Dr. Galelli serves various research communities—AGU, EGU, ASCE, and iEMSs—as reviewer and convener, and sits on the editorial board of Environmental Modelling & Software and the Journal of Water Resources Planning and Management. At SUTD, Dr. Galelli leads the Resilient Water Systems Group, which develops algorithms and tools for the optimal operation of large-scale water resources systems. For his contribution to research, Dr. Galelli was awarded the Early Career Research Excellence Award (2014) by the international Environmental Modelling & Software society and the 2017 SUTD Excellence in Research Award.

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23. Date : 16 July 2019

Presenters : Mr. Christophe Inglin (SEAS), Dr. Thomas REINDL (SERIS), Dr Santo Salinas (CRISP), Mr. CHIA Zhong Yi (CCRS)

Presenter 1: Mr. Christophe Inglin (Sustainable Energy Association of Singapore)
Topic : **Predicting the sun**

Abstract

Solar PV generators have the huge advantage of zero fuel costs because they run on sunlight. But while we know exactly when the sun rises and sets each day, we have no control over daily weather, nor over passing clouds that can cause PV output to drop and rise again by as much as 80% within minutes. Consequently, PV generators are intermittent sources of electricity.

As long as PV only contributes a small percentage of total electricity, our national grid can easily accommodate this solar intermittency. As of mid-2019 Singapore has approx 200MWp of PV installed, which generates only ~2% of peak demand in bright sunshine. Within a decade, those figures could rise by a factor of 10, giving PV a significant role in our electricity mix.

With rising PV penetration levels, intermittency can disrupt the grid unless compensated by storage, spinning reserves, or demand response (DR), in increasing order of response time. The shorter the response time needed, the higher the cost to compensate intermittency.

Conventional weather forecasts help us anticipate how much energy our PV systems will generate over the next days and hours. But they are too generic to predict conditions from one minute to the next, or at any given location. To reduce the cost of managing intermittency, we need highly accurate, site-specific solar forecasts at 5- or 10-second resolution, several minutes ahead of each event. Then we all benefit from lower overall electricity prices and lower carbon footprint, without compromising reliability of supply.

Bio

Mr. Christophe Inglin is a veteran of the solar photovoltaics (PV) industry with over two decades of experience throughout the value chain from silicon ingots to turnkey solar power plants. He started in PV back in 1996 as Managing Director of Siemens Showa Solar in Singapore.

In 2006 Christophe cofounded Phoenix Solar Pte Ltd, which undertook design and EPC construction of >100MW of PV projects in SE Asia, India and Middle East.

Since mid-2015, he is Co-founder and Managing Director of Energetix Pte Ltd, which designs, installs and maintains rooftop solar power plants and utility-scale solar farms in SE Asia.

Christophe has a BSc in Electronic & Electrical Engineering from the University of Surrey in England, and an MBA from INSEAD in France.

Presenter 2: Thomas REINDL (Solar Energy Research Institute of Singapore)
Topic : **Operational irradiance forecasting for advanced PV grid integration in Singapore**

Abstract

To facilitate large-scale deployment of solar photovoltaic (PV) power generation into the Singapore grid without disrupting the quality and reliability of electric supply, forecasting of the

largely distributed solar power generation is necessary. Due to its location in the inter-tropical convergence zone and to local meteorological phenomena, irradiance forecasting for Singapore requires a suite of techniques that must be applied in order to achieve a seamless forecasting output from 5 minutes to 7 hours ahead. These techniques range from statistical methods for the short-term horizon (up to 30min) to physical cloud cover predictions and complex numerical weather predictions (NWP) for hours-ahead forecasts. SERIS, together with other groups at NUS (ECE, CRISP), A*STAR EPGC and Met Services Singapore, is developing and implementing an operational forecasting system for the local power system operator to facilitate higher shares of PV integration into the electric power grid.

Bio

Dr Thomas REINDL is Deputy CEO of the Solar Energy Research Institute of Singapore (SERIS) and Principal Research Fellow at the National University of Singapore (NUS). He started with photovoltaics (PV) in 1992 at the SIEMENS Corporate R&D Labs. After holding several management positions at SIEMENS and running one of the leading German PV systems integration companies as Chief Operating Officer, he joined SERIS in 2010 and soon became Director of the Solar Energy System cluster. During his time at SERIS, he won public research grants in excess of SGD 20 million, founded 2 spin-off companies and authored strategic scientific papers such as the "PV Roadmap for Singapore".

Dr Reindl holds a Master in Chemistry, a Ph.D. in Natural Sciences and an MBA from INSEAD, all awarded with highest honors. His research interest are high-performance PV and embedded systems, techno economic road-mapping and the reliable integration of renewable energies into power systems. He is also the Principal Investigator of the “Solar Forecasting” project in Singapore.

Presenter 3: Dr Santo Salinas (Centre for Remote Imaging Sensing and Processing)
Topic : A Hybrid Approach to Medium Term Solar Radiation Forecast

Abstract

Medium term solar radiation forecast is a very active area of research as no single technique is able to achieve forecasting skill comparable with the very short-term (min) and longer term solar radiation forecasts (few hrs/days). To approach the medium term solar forecast problem (1 to 3 Hrs), we propose a hybrid approach that includes high resolution, high frequency satellite remote sensing, ground-based observations of cloud horizontal and vertical distribution and a quasi-static 1D/3D radiative transfer method (QRTM) complemented by NWP forecasts for all meteorological fields except for the radiation problem. For this purpose, a near-real time direct broadcast and in-house cloud products from Himawari8/9 satellite are used extensively. Cloud motion algorithms relying on single/ multiple imagery as well as on cloud data products are used to forecast future cloud fields. Moreover, to enhance the forecast of cloud fields, we couple cloud motion algorithms to wind fields generated by GFS/NCEP/WRF or any other NWP forecast. Once a future cloud scenario and all its physical and optical properties are generated, a suitable 1D/3D radiative transfer model is used to generate a forecast radiation field. In this presentation, we report our current advances to date as well as highlight difficulties and limitation of the proposed approach.

Bio

Dr Santo Salinas is a senior scientist at the Centre for Remote Imaging Sensing and Processing (CRISP). He holds a PhD degree (Physics) from the University of Gottingen, Germany (2003). He specializes in atmospheric radiation, cloud and aerosol physics and remote sensing. Currently, Dr. Salinas is principal investigator for AERONET & MPLNET-Singapore and he has concurrent research projects and collaborations with NRL, NASA (AERONET, MPLNET) and an active member and Singapore's representative at the 7SEAS initiative. Dr. Salinas has published actively on the local/regional aerosol environment and he's PI/co-PI of several national level projects in air quality, remote sensing and solar radiation.

Presenter 4: CHIA Zhong Yi (CCRS)

Topic **: Are we doing a good job in forecasting surface solar irradiance? - Quantifying cloud uncertainties using observation data**

Abstract

Solar energy is a low-risk clean energy for Singapore. By 2030, Singapore plans to raise adoption of solar power to 1000 MWp (MegaWatt of peak electric power produced by solar panel). However, the output of solar panel can be affected by highly variable weather conditions. Consequently, the fluctuating power output will impact the stability of the energy grid. To anticipate and then mitigate the fluctuations in solar power, many sophisticated techniques have been developed for forecasting surface solar irradiance. Amid the race to reduce forecast error, we took a step backward and asked a different question. How large are the uncertainties in the irradiance due to the variabilities of clouds? The answer will help to set up a milestone for the development of solar forecasting. Until our numerical models can well predict the variabilities of clouds, there is always a hard barrier despite the efforts in reducing the forecast error.

Bio

Chia Zhong Yi is a research officer in Meteorological Service Singapore. He obtained his Bachelor of Science in physics from Nanyang Technological University, Singapore and his Master of Science in atmospheric and oceanic sciences from McGill University, Canada. Currently, his work involves the development of forecasting techniques for surface solar irradiance in Singapore. His previous relevant experience includes the computation of solar irradiance due to the orbital dynamics of the Earth and numerical weather modelling at convection-permitting length scales.

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24. Date : 24 July 2019
NO SEMINAR

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25. Date : 31 July 2019
NO SEMINAR

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26. Date : 7 August 2019

Presenter : Dr. Nguyen Tan Thai Hung (SUTD)

Theme : Spatial-temporal variability of streamflow in monsoon Asia over the past eight centuries and links to climate drivers

Abstract

The Asian Monsoon region is home to a quarter of the world's population, most of whom relies on rivers for water supply. Water management in this region would benefit from an improved understanding of long-term hydrologic variability, made possible with streamflow reconstruction studies. In this work, we produce the first large-scale streamflow reconstruction over the last eight centuries in monsoon Asia, using a Linear Dynamical Systems approach and the Monsoon Asia Drought Atlas (MADA) as the paleoclimate proxy. The reconstructions reveal a history of regime shifts with prolonged droughts exceeding the lengths of those found in instrumental records and show the spatial footprints of the Asian mega droughts. Analyses of the dominant modes of variability suggest that streamflow in Asia is linked to both ENSO and IOD, but these relationships vary significantly through space and time. Overall, the findings presented advance understanding of regional hydrologic variability and can help improve water resource management practice in many countries.

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27. Date : 14 August 2019

NO SEMINAR

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28. Date : 21 August 2019

Presenter : Kai Wen TEO (PUB)

Theme : Knowledge/Results sharing on the application of deep learning models for radar rainfall/flood nowcasting

Abstract

To cater to the imminent threats of changing weather pattern and increase urbanisation, Singapore's national water agency, PUB, aims to improve its flood forecasting system. In light of the recent advancement in deep learning, many studies have cited promising results of deep learning model (ConvLSTM) on radar rainfall nowcasting. Thus, this MSc research work is dedicated to pilot study the application of deep learning models (ConvLSTM and its variants) in area of radar rainfall nowcasting and flood forecasting, for the case of Singapore. The deep learning model adopts a hybrid combination of convolutional neural network which is commonly used in computer vision tasks such as face recognition and image classification; and the recurrent neural network which is typically used in language translation. The deep learning models were trained using past observed radar images from Metrological Service Singapore (MSS) to forecast future water levels at 5 locations in Bedok Catchment of Singapore. The model was trained on 56 rain days, validated with 17 rain days and tested on 18 rain days. It was found that the deep learning model can obtain an average RMSE of 0.19m across all 5 sensors, indicating its potential as a possible alternative to flood forecasting. The results of this research would also be useful for tropical countries with dynamic weather patterns and small flashy catchments.

Bio

Ms. Teo Kai Wen graduated from Environmental Engineering at Nanyang Technology University of Singapore in 2011. She started her career with Singapore's national water agency (PUB), as a drainage planning engineer in the Catchment and Waterways department. She was subsequently rotated to the hydrodynamic modelling team where she carry out 1D/2D hydraulic simulations, assess flood risks and identify flood mitigation measures for areas in Singapore. During her stint with the modelling team, Kai Wen also worked on PUB's R&D initiatives such as implementation of x-band weather radars at PUB installations and the Smart Drainage Grid network system. In 2017, Kai Wen left Singapore for her PUB-sponsored MSc at IHE Delft, the Netherlands, specialising in Hydroinformatics. Kai Wen completed her MSc research work on deep learning models for radar rainfall nowcasting and flood forecasting before returning to Singapore in 2019. She now serves in the Policy Planning department of PUB.

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29. Date : 28 August 2019
Presenter : Anurag, Joshua and Prasanna (CCRS)
Theme : Debriefing the UM User Workshop 2019 / Visit to Met Office / GC Teleconnections Workshop 2019 held at Exeter, United Kingdom, 17-26 June 2019

Abstract

Three CCRS colleagues Joshua, Prasanna and Anurag recently attended the UM User Workshop in Exeter, United Kingdom from 17th to 21st June 2019. Later, Joshua Lee visited the UK Met Office from 24th to 25th June 2019, while Prasanna attended the GC Teleconnections Workshop from 24th to 26th June 2019. They will be sharing with us, what they've learned from the workshop including status/plans of UM model developments and next generation modelling systems development (NGMS), data assimilation and observations processing, GC Teleconnection Workshop outcomes and proposals for future actions.

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30. Date : 4 September 2019
Presenter : Wee Leng Tan, Muhammad Eeqmal Hassim, Thea Turkington (CCRS)
Theme : Highlights from EGU (April, 2019)
Abstract

This talk will cover the highlights of the European Geosciences Union General Assembly 7-12 April 2019. During EGU 2019, 16,273 scientists from 113 countries joined together for thousands of presentations (5531 orals, 9432 posters and 1287 PICOs). As it would be impossible to present on all that was experienced this year, each presenter will touch on their two key highlights from the group. Wee Leng Tan will discuss the current status and progress of precipitation measurement, giving some insight to the Global Precipitation Measurement, and also will mention some available interesting remote sensing products. Muhammad will cover the application and selected results of convection-permitting regional climate simulations and explain what a PICO is. Highlights from Thea include an attempt to address the question of why are their more back to back La Niña events (and whether CMIP5 models can capture this) as well as some differing

opinions on science communication (including a call for more equations). We hope you will join us for an interesting discussion on a wide range of topics!

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31. Date : 12 September 2019
Presenter : Rajesh Kumar (CCRS)
Theme : Role of sea-spray in modifying the sea-surface roughness and wave-ice interaction in the marginal ice zone.

Abstract
In this talk, first part discusses the effect of sea spray in modifying the wind and wave parameters using a coupled atmosphere-wave model. An accurate representation of momentum and energy exchange at air–sea interface is very important for ocean modelling and climate studies. Since these exchanges take place in the wave boundary layer, one cannot neglect the importance of ocean surface waves in modifying air-sea interaction processes. In order to understand the effect of sea spray, we have introduced a sea-spray parameterization scheme in the atmospheric model (WRF). It is observed that the newly added sea-spray scheme shows a better performance compared to all the three existing formulations. In the second part, attenuation of surface gravity wave due to sea ice is discussed. The wave attenuation is calculated using a numerical wave model and observations in the marginal ice zone.

Keywords
sea surface roughness, sea spray, WRF, SWAN, Sea-Ice, WAM, Marginal Ice Zone

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32. Date : 18 September 2019
Presenter : Erick Becker (CCRS)
Theme : Towards a Radar-Based Nowcasting system for MSS

Abstract
In an operational environment such as a Met Services the end goal for any Nowcasting product derived from weather radar data is to be as accurate and reliable as possible. However, in order to provide clients and the public with reliable nowcasts; data quality and availability is just as important as the nowcasting algorithms/models themselves. It then becomes important to consider the entire data processing value chain, as one “weak link” in the chain can result in undesirable outcomes.

The first part in this chain is the radar observation component which relate to radar calibration and signal processing. The second part deals with data quality control and composite processing of 2 or more radars in an observation network. The third part relates to precipitation estimation before finally nowcasts from these results can be produced.

Some initial results from the aforementioned components in the value chain will be shown in this talk. Highlighting some of the challenges and also discussing recommendation for potential improvement and future studies.

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33. Date : 27 September 2019
Presenter : Yudha Setiawan Djamil (NTU)
Theme : Mid-Holocene climate change over the Maritime Continent: Impact, Attribution, and Mechanisms

Abstract
Earth's climate during the mid-Holocene era (~6,000 years ago) relative to today was mainly characterized by a stronger incoming solar radiation (i.e., an insolation optimum). However, internal oceanic feedback such as through sea surface temperature (SST) is also known to drive the climate over the Maritime Continent. In this research, I identify the climate impact from the two factors (insolation and SST) by studying climate proxy records and performing numerical experiments.

Rainfall proxy (e.g., speleothem δ18O) records from the large islands in the Maritime Continent show a wetter climate during the mid-Holocene compared to today. These features are well simulated by the Community Climate System Model version 4 (CCSM4). Furthermore, my numerical experiments by using the Community Atmospheric Model version 4 (CAM4) show stronger insolation rather than warmer SST as the main driver to increase convection over the large islands in the Maritime Continent. Stronger islands convection, then, weakens the local Hadley circulation during the Summer-to-Autumn season. In complement, impact from changing El Nino-Southern Oscillation (ENSO) is also investigated.

Bio
Yudha Setiawan Djamil received his BSc. in Meteorology from the School of Geophysics and Meteorology, Bandung Institute of Technology (ITB), Indonesia. Recently he received his Ph.D. degree at the Asian School of the Environment, Nanyang Technological University under the supervision of Associate Professor Wang Xianfeng. In his Ph.D. work, he used atmosphere General Circulation Model (AGCM) experiments to explain the fundamental mechanisms of precipitation change between the pre-Industrial and the mid-Holocene eras over the Maritime Continent.

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34. Date : 2 October 2019
NO SEMINAR

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35. Date : 9 October 2019
Presenter : Indumati (CCRS)
Theme : Regional and local sea level variations: What have we learned? What are the new challenges?

Abstract
Sea level rise is one of the most severe impacts of climate change posing a major threat especially to highly populated low-lying coastal regions and island nations of the world. Since the 20th

century observational data show a rise in global sea level which has further accelerated over the recent decades. Sea level change is not a smooth and globally uniform process. Instead, it shows strong regional patterns at both temporal and spatial scales that deviate substantially from the global average. Locally, sea level can further deviate from global average owing to vertical land motion that are confined to local processes. In this talk, various aspects of regional sea level such as causes, variability in terms of natural internal climate modes will be discussed. Furthermore, challenges involved in regional sea level budget studies, importance of altimetry based coastal sea level measurements and its challenges will also be addressed.

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36. Date : 16 October 2019
Presenter : Gerald Lim (CCRS)
Theme : Detecting the Contribution of Changes in Atmospheric Circulation Patterns to Regional Climate Change

Abstract
Predicting changes in mid-latitude atmospheric circulation and its relationships with regional climate changes, e.g. in weather extremes or rainfall, remain difficult. A significant part of uncertainty in regional projections stem from the complexity of atmospheric dynamics and its response to increasing atmospheric greenhouse gases. Hence, increasing confidence in regional changes, which have a more direct impact on lives, is arguably one of the forefront challenges in present-day science. In this talk, I'll cover the work put in to set up an on-going PhD project that aims to use machine learning to build a data-driven mathematical framework for regional climate change that will 1) necessarily include both the thermodynamic and dynamical response of the Earth system to greenhouse gas forcing and 2) attempt to separate dynamical and regional drivers of regional change. The methodology in focus will be the Self Organising Map (SOM) algorithm which was used in a recent similar study to cluster 500 hPa geopotential height fields from reanalysis data (1979 – 2013) into clusters of characteristic atmospheric circulations. While results from reanalysis data suggest robust contributions from the dynamics of these patterns to extreme weather trends, complications arise when applying the method to longer timescales over the application of detrending which we will show greatly affects the extent of the dynamical component. As this project carries on, work has now branched into identifying other possible metrics of atmospheric flow and working through the CMIP5 ensemble.

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37. Date : 23 October 2019
Presenter : Bijoy Thompson (TMSI)
Theme : Barotropic configuration of NEMO for the Maritime Continent

Abstract
A Barotropic regional configuration of the Nucleus for European Modelling of the Ocean (NEMO3.6) ocean model has been developed for the Maritime Continent (MC). Capability of the

model to simulate the sea level under different forcing conditions is investigated. Tidal elevations and currents corresponding to 15 major constituents obtained from the Finite Element Solution tide model (FES2014b) are used for providing the tidal harmonics at the lateral boundaries. Hourly varying 10-m surface wind from ERA5 atmospheric reanalysis data is also included as the surface boundary condition in the tide plus wind forced experiments. The ocean bottom friction is computed using a quadratic formulation. A set of experiments with a constant as well as spatially varying bottom friction coefficients are performed to improve the accuracy of tide sea level simulations. Sea level simulated by the NEMO tide-only models are compared with the corresponding tidal harmonics data estimated from various tide gauge stations across the domain.

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38. Date : 30 October 2019
NO SEMINAR

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39. Date : 7 November 2019
Presenter : Luigi.Cavaleri, Institute of Marine Sciences, National Research Council, Venice, Italy
Theme : The October 29, 2018 storm in Northern Italy – an exceptional event and its wave and surge modelling

Abstract
The storm developed as an explosive cyclogenesis north of Tunisia following a cold input from the Gulf of Lion (see map). The ensuing very compact low deepened very rapidly moving at high speed (A) toward North. The low forced strong winds with possible dynamical wave generation on its right flank (B), winds squeezed between the low and the Apennines range along the Italian peninsula. This led to very large waves (compared to the local standard (Hs > 7 m) from an unusual direction with consequent heavy damages to roads, harbours, boats, houses et al. in usually protected areas. Carrying on, it brought large waves also on the coast west of Genoa. At the same time and on the other side of the Apennines the presence of a high pressure zone over the Balkans forced strong south-east sirocco winds (C) toward Venice leading to one of its largest historical floods (but see below).

Entering land, the low sucked on its back a strong and cold energetic flow (D) from the Gulf of Lion. These wind and front were strong and fast, leading again to 7 m Hs waves on the coast east of Genoa. They then surpassed the Apennines range precipitating into the Adriatic basin. The change of wind direction stopped the growing flood at the town (but again see below), but, forcing the sirocco against the Eastern Alps and possibly also tri-dimensionally (under study), it led to the record wind speeds recorded before the instruments were destroyed (213 kmh-1, 190, 180, 160 .. at different locations).

Notwithstanding the flood (third or fourth in history, matter of centimetres), in Venice we were lucky because the six hour phase difference between astronomical tide and surge contribution saved the town from an historical disaster. For a tiny random difference this could have been the

most dramatic event of the town, much larger than even the 1966 one that triggered world attention.

The exceptionality of both the natural event and the Venice flood prompted a collective institutional effort to fully understand and to model its meteorological, wave and surge aspect. For meteorology we asked a contribution by ISAC and ECMWF.

Ample measurements are available from Venice, the coast, but most of all from the ISMAR oceanographic tower 15 km offshore. With the over-structures half-destroyed in a similar storm in 1979, it was wisely raised of 2 metres in its refurbishment of one year ago, perfectly (instruments and structures) surviving the storm. The data, combined with the ones on land, provide a unique data-set involving all the aspects of large scale and coastal oceanography. Apart from the overall modelling approach to the storm, we will focus mainly on two aspects. One is the extensive coastal wave set-up available from the tidal data at the coast and at the tower. The other rather unique piece of information concerns the drastic change of wind direction at a certain time of the storm and the contemporary collapse (-20 cm in a few minutes) of the coastal surge. This provides an indirect estimate of the actual wind stress at the surface and a direct assessment of how good are the models in reproducing it.

A rather unique piece of information is that fact that the storm was also recorded by seismometers 50 km inland. Three different pieces and sources of information, once put together, provide full evidence of the theory and experimental results.

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40. **Date** : 13 November 2019
Presenter : Thea Turkington (CCRS)
Theme : Subseasonal predictions and Model Output Statistics in Southeast Asia: a PyCPT perspective from recent IRI visit

Abstract
Since 2018 the SSP section have been contributing to the development of PyCPT: a Python based tool for processing and viewing subseasonal forecasts developed by the International Research Institute for Climate and Society (IRI). IRI is known for its expertise and experience in generating tailored climate services underpinned by robust techniques for different user sectors, in particular disaster risk management (DRM) and water. Through avenues such as the Subseasonal to Seasonal –Southeast Asia (S2S-SEA) workshop series, the Subseasonal and Seasonal Prediction section (SSP) has developed a good working relationship with IRI. During my recent visit to IRI, I continued working on PyCPT with a focus on outcomes for Southeast Asia.

This presentation will cover the first attempt to answer the question: do model output statistics improve skill/usefulness of S2S for Southeast Asia? The presentation will cover an introduction to CPT and PyCPT, as well as how the SSP team started working on PyCPT. The talk will then compare the MOS techniques principle component regression and canonical correlation analysis with simple mean bias correction to see if MOS can improve subseasonal forecasts for regions in Southeast Asia. Two case studies relevant for DRM will be assessed: the drought in Java starting

June 2019 and flooding in Myanmar early July 2019. Finally, upcoming developments in PyCPT will be discussed.

Come to the talk learn more about PyCPT, or share your thoughts and suggestions for using MOS techniques for subseasonal forecasts in Southeast Asia!

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41. Date : 20 November 2019
Presenter : Dale Barker (Met office)
Theme : Status/Plans for Weather Science activities at the Met Office

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42. Date : 25 November (10:00-12:00)
Presenter 1: Akihiko Shimpo (Tokyo Climate Center / Japan Meteorological Agency)
Theme : Introduction of the Tokyo Climate Center (TCC) and its services

Abstract
The Tokyo Climate Center (TCC) of the Japan Meteorological Agency (JMA), which serves as a World Meteorological Organization (WMO) Regional Climate Centre (RCC) in the Regional Association II (RA II; Asia), provides a variety of information, products and tools through its dedicated website, as well as capacity development activities such as annual TCC training workshop, to assist the National Meteorological and Hydrological Services (NMHSs) in the Asia-Pacific region. JMA has also served as a WMO Global Producing Centre for Long-range Forecasts (GPC-LRF), which is a part of World Meteorological Centre (WMC) for long-range forecasts, providing ensemble prediction products for such forecasts.

In this presentation, products and tools available on the TCC website including recent and planned improvements will be introduced.

Profile of the speaker
Mr. Akihiko Shimpo has mainly been working for TCC/JMA, since his joining JMA. He had been involved in the development of JMA's numerical weather prediction models such as One-month and Seasonal Ensemble Prediction Systems. In recent years, Mr. Shimpo has been involved in monitoring global climate system focusing on atmospheric circulation, tropical convection and oceanographic conditions, and producing monthly/seasonal/annual reports as well as special reports for extreme events occurred in Japan. Mr Shimpo has also been engaged in activities under the WMO Commission for Climatology (CCl), as a co-chair of WMO CCl Focus Area 2 – Climate Services Information System (CSIS) Operations.

Presenter 2: Takuya Komori (Tokyo Climate Center / Japan Meteorological Agency)
Theme : Introduction of JMA's Global EPS, Seasonal EPS and JRA-3Q

Abstract
Japan Meteorological Agency (JMA) operates some kinds of Numerical Weather Prediction (NWP) systems including Ensemble Prediction Systems (EPSs) to meet various requirements with covering a wide temporal range of forecast periods from a few hours to seasons to provide a seamless sequence of products mainly for the domestic.

Among the systems, the Global EPS, which is based on an atmospheric model, produces forecasts up to 34 days ahead to support tropical cyclone forecasts, one-week forecasts, two-week forecasts and one-month forecasts as well as issuance of Early Warning Information on Extreme Weather. In addition, the Seasonal EPS, which is based on an atmosphere-ocean coupled model, produces forecasts up to seven-month to support three-month forecasts, warm- and cold-season outlooks and El Nino outlooks. As initial conditions of the Seasonal EPS and hindcast experiments for both EPSs, current JMA's global reanalysis JRA-55, which covers 55 years or longer, is needed. This presentation will provide an overview of ongoing development/research activities of Global EPS, Seasonal EPS and new global reanalysis JRA-3Q, which covers three quarters of a century with higher resolution, including plans for implementation in near future.

Profile of the speaker
Mr. Takuya Komori is currently Scientific Officer at Tokyo Climate Center (TCC)/JMA. He had worked for model development of deterministic Global Spectral Model (GSM) and newly implementing Typhoon EPS with being involved in activities of the ESCAP/WMO Typhoon Committee. In the WMO THORPEX - Pacific Asian Regional Campaign (T-PARC) 2008, he investigated usefulness of sensitivity analysis for Typhoon track forecast using Singular Vector method. After working at ECMWF from 2012 to 2014 in a reanalysis project, he has been involved in developments of both Global EPS and Seasonal EPS, targeting on MJO through improvement of convection scheme and investigating on atmosphere-ocean coupling especially for its initial shock and model error growth. In recent years, he has joined several Regional Climate Outlook Forums (RCOFs) as a part of TCC activities.

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43. Date : 25 November (14:00-15:00)
Presenters : Blair Trewin (Bureau of Meteorology, Australia)
Theme : Challenges in operational global climate monitoring

Abstract
The WMO plays a leading role in operational global climate monitoring through its annual State of the Climate reports and other products. In this presentation I will outline some of the challenges involved, including the consistency (or lack thereof) of underlying data sets, the timeliness of key information, and the wide variability in the quantity of information available from different parts of the world. Also discussed will be the challenges of finding authoritative information on extreme events, both for abnormal climatological values of a variable, and in getting good-quality information on impacts of extreme events.

Profile of the speaker
Lead, WMO Expert Team on Operational Climate Monitoring

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44. Date : 4 December 2019
NO SEMINAR

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45. Date : 11 December 2019
NO SEMINAR

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46. Date : 18 December 2019
Presenter : Anurag (CCRS)
Theme : Investigating Squall Lines in SINGV- a comparative study with WRF

Abstract
It's been long known that SINGV has issues in simulating squall lines whereas WRF tends to over produce them. We have been investigating this issue since the beginning of this year. In this talk, I will present some new results from the idealized simulations we have been doing using SINGV and WRF, and will summarize our findings so far.

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47. Date : 25 December 2019
PUBLIC HOLIDAY (CHRISTMAS DAY)
