

- Conference Title:

2016 CoRP Symposium

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- Title:

Projected Changes in Flood and Drought Risks in the 21st Century: A Multi-model Assessment

- Type of Presentation:

Poster

- Abstract:

Anthropogenic changes in global climate and alteration of Earth's hydrological cycle have resulted in increased heavy precipitation, with consequent increased surface runoff and flooding risk, which is likely to worsen in the future. We analyze the historical and future streamflow simulations from selected global climate models (GCMs) provided by the Inter-Sectoral Impact Model Intercomparison Project (ISI-MIP). We study the changes in low and high percentiles of streamflow discharge, as indicators of changes in drought and flood risk, in GCM projections for the 20th and 21st centuries. The discharge projections from climate models are affected by uncertainties arising from the utilized global hydrological models (GHMs), in addition to the basic uncertainties from the GCMs. We perform a global-scale multi-GCM multi-GHM study on the discharge projections (provided by the ISI-MIP), under high radiative forcing scenario (RCP8.5), to investigate probable changes in drought and flood risk, by the end of the 21st century. Results indicate that approximately 47.3 and 58.9% of the global land areas are exposed to increased flood and drought risk, respectively. Furthermore, nearly 13.2% of the global land areas are under the potential threat of simultaneous increase in flood and drought risk. We expect our findings to improve understandings of future climate conditions under the projected global warming and help inform assessments of flood and drought hazards.

Projected Changes in Flood and Drought Risks Under Climate Change in the 21st Century: A Multi-GCM Multi-GHM Approach

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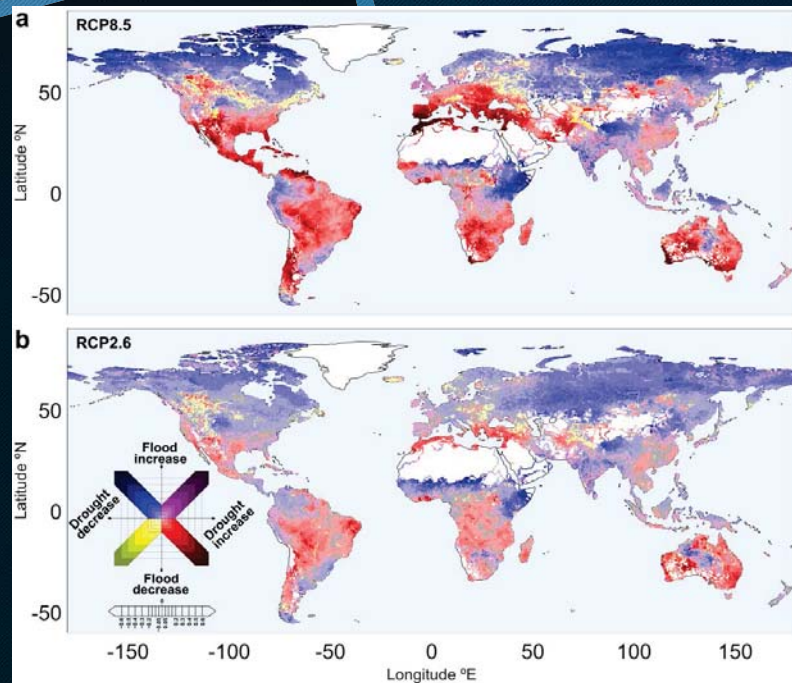
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NOAA | CREST



Study Overview:

- ✓ Changes in Flood and Drought in 21C compared to 20C
- ✓ RCP2.6 and RCP8.5 Scenarios
- ✓ Study the changes in High and Low streamflow percentiles (95th and 5th)
- ✓ Using 5 GCMs and 5 GHMs (Total 25 dataset)
- ✓ Study the population affected by increase in Flood, Drought, or both



Comparison of results of polarimetric imaging and radiative transfer modeling of the atmosphere-ocean system

**Carlos Carrizo, Anna McGilloway
Ahmed El-Hasashi, Robert Foster, Matteo Ottaviani, Alex Gilerson**

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Quantitative polarimetric imaging of the sky and ocean surfaces can drastically improve the knowledge of the remote sensing of the atmosphere and the retrieval of water parameters because of the obvious increase in information content carried in such measurement. However, technological difficulties have long challenged the design and assembly of polarimetric instruments capable of measuring a scene's Stokes vector with satisfactory accuracy. In addition to this, deploying such instruments (i.e.: polarization camera) in the field is often critical due to the rough environment to which they are exposed as well as the significant uncertainties in orientation from unstable platforms such ships. We present results from the calibration technique adopted for the commercially available, full-Stokes polarimetric camera (SALSA , Bossa Nova Technologies), together with the analysis of measurements acquired in the lab, and in the field on different ocean-water types. The images are validated against simultaneous and co-located measurements by a hyperspectral radiometric polarimeter (HyperSAS-POL). Camera measurements of the sky and the water surface for various viewing angles and atmospheric and oceanic conditions were successfully matched with results of modeling using a vector radiative transfer code for the atmosphere-ocean system.

Impacts of water constituents on the TOA radiances for scalar and vector radiative transfer simulations

Carlos Carrizo¹, Matteo Ottaviani¹, Amir Ibrahim³, Michael Ondrusek², Alex Gilerson¹, Sam Ahmed¹

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INTRODUCTION

Modern satellites such as MODIS (*Moderate Resolution Imaging Spectroradiometer*) and VIIRS (*Visible Infrared Imaging Radiometer Suite*) collect daily datasets of Top of the Atmosphere (TOA) reflectances used to retrieve ocean and coastal waters Inherent Optical Properties (IOPs). These properties (IOPs) are then used to estimate Ocean Color (OC) products such as phytoplankton absorption and concentration, color dissolved organic matter (cdom), etc. These retrievals can be significantly improved if sensitivity to polarization (accounted for as much as 3% at the TOA reflectances) is properly evaluated and corrected.

Knowledge of the typical solar-satellite geometries and the impacts of typical water constituents can help to better estimate TOA radiances over oceanic and coastal waters. Further analysis of this work is expected to include the impact of atmospheric aerosols and hydrosols more commonly found in coastal regions.

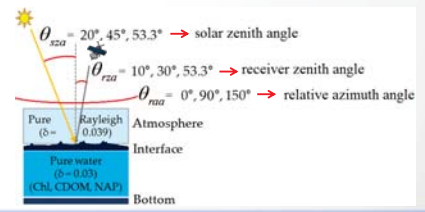
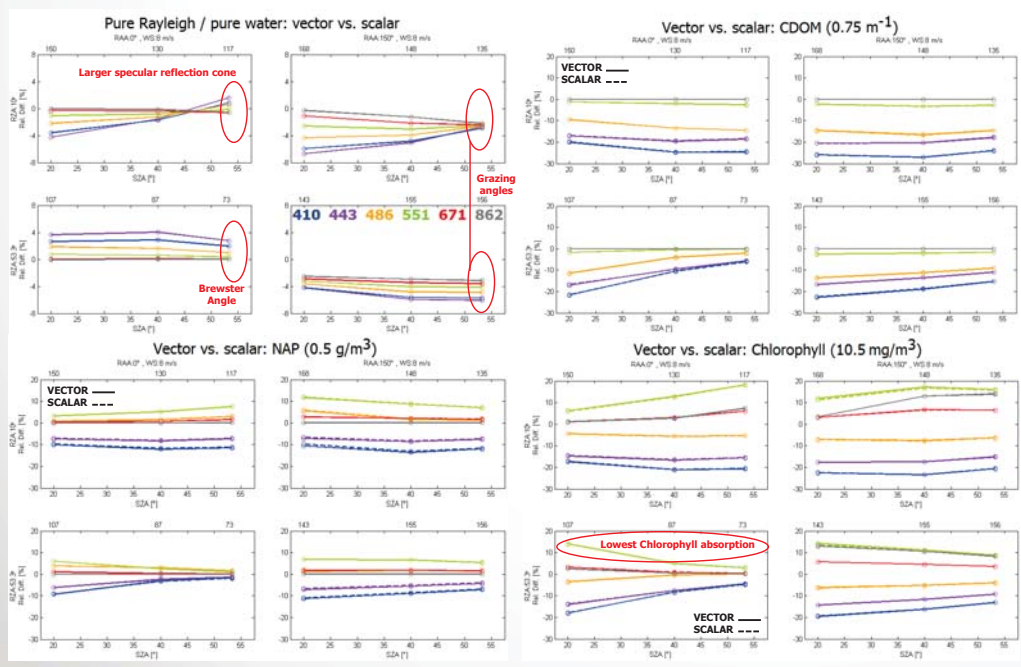
CONCLUSIONS

- **Scalar treatment underestimates the TOA radiance** with respect to more accurate vector radiative transfer (VRT) simulations.
- Relative differences higher than 10% are encountered at all modeled geometries when water constituents are added in excess (i.e. maximum concentration among typical values) and generally with higher values at shorter wavelengths.
- Negative relative differences in the mid-visible for large concentrations of Chlorophyll are explained by larger absorption.
- Decreasing absorption implies increasing scattering, which leads to depolarization.
- Negative relative differences for larger concentrations of CDOM and Chlorophyll in the blue-green are due to increased absorption and polarization.
- **Even small differences affect OC products**, see for example NAP (non-algal particles) in the green band.

METHODOLOGY

- A simplified air/water interface has been adopted to compare the results of radiative transfer (RT) simulations in scalar and vector modes using RayXP code. RayXP is a polarized, atmosphere/ocean coupled radiative transfer code which includes wind-roughened surface.
- This simplified model includes a pure Rayleigh atmosphere (no aerosols) and pure water (no hydrosols) with depolarization factors (δ) of 0.039 for sky and 0.03 for water.
- Relative differences are calculated as $(D1-D0)/D0$, where:
 - **D0** is the radiative transfer simulation (TOA normalized radiance) of Pure Rayleigh/ Pure water case (PRPW).
 - **D1** is the radiative transfer simulation (TOA normalized radiances) of PRPW + water constituent (i.e.: CDOM, Chlorophyll, NAP).
- The impact of CDOM to the TOA radiance is simulated by varying its absorption from 0.05 m^{-1} to 0.75 m^{-1} .
- Contribution of Chlorophyll has been simulated for two concentrations: 2 mg/m^3 and 10.5 mg/m^3 . Other parameters for Chlorophyll simulations include the refractive index (1.06 relative to water) and particle size distribution (ξ) of 2.995 and 4.0, respectively.
- NAP concentrations are taken as 0.5 g/m^3 and 7.55 g/m^3 with index of refraction 1.18 relative to water and particle size distribution (ξ) of 2.995 and 4.0.
- Both index of refraction and particle size distribution play a significant role in the polarization features of the scattering media, for this reason only typical values are being considered and studied.
- Different sun-receiver geometries are explored (SZA, RZA and RAA).
- Additional inputs such as Chlorophyll and NAP scattering matrices are obtained from well-known in-situ field measured data and Mie theory calculations
- Atmospheric aerosols are not considered (further analysis will be considered in future work).
- Optically semi-infinite waters. Bottom is black.

RESULTS



REFERENCES

1. A. Ibrahim, A. Gilerson, T. Harmel, A. Tonizzo, and S. Ahmed, "The relationship between upwelling underwater polarization and attenuation/absorption ratio" *Opt. Express* DOI: 10.1364/OE.20.025662 (2012)
2. S. Hlaing, A. Gilerson, R. Foster, M. Wang, R. Arnone, and S. Ahmed, "Radiometric calibration of ocean color satellite sensors using AERONET-OC data," *Opt. Express* DOI:10.1364/OE.22.023385 (2014).

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Conference Title: 2016 CoRP Symposium

Author(s):

M. Dagan,* B. Thomas, S. Dobryansky, F. Moshary

Title:

Implementation of Micropulse Lidar at 4.5 μm and 1.5 μm for Aerosol and Cloud Study

Type of Presentation: Poster

Short Abstract:

Identifying and quantifying ambient aerosols and their interactions with clouds are important for air-quality and climate studies. Advances in infrared technologies on fiber lasers, quantum cascade lasers and IR detectors have made developing micro-pulse (low energy) IR lidar systems operating in the infrared spectral range feasible. We present in this contribution a micropulse dual channel (IR wavelength) lidar system for studying aerosol and cloud optical properties. The system operates at 1.545 μm (6472.5 cm^{-1}) and at 4.55 μm (2197.8 cm^{-1}) with high repetition rates and microjoule pulses. The system is intended to be coupled with an existing UV, visible, near infrared lidar system at the city college of New York, part of the CREST lidar network. Preliminary backscattered signals from this system are here presented and compared to SNR simulation.

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Conference Title: 2016 CoRP Symposium

Author(s): Adrian Diaz, Benjamin Thomas, Paulo Castillo, Barry Gross, Fred Moshary

Title: **Active standoff detection of CH₄ and N₂O leaks using hard-target backscattered light using an open-path quantum cascade laser sensor**

Type of Presentation: Poster
 Oral

Short Abstract:

Fugitive gas emissions from agricultural or industrial plants and gas pipelines are an important environmental concern as they contribute to the global increase of greenhouse gas concentrations. Moreover, they are also a security and safety concern because of possible risk of fire/explosion or toxicity. This study presents standoff detection of CH₄ and N₂O leaks using a quantum cascade laser open-path system that retrieves path-averaged concentrations by collecting the backscattered light from a remote hard target. It is a true standoff system and differs from other open-path systems that are deployed as point samplers or long-path transmission systems that use retroreflectors. The measured absorption spectra are obtained using a thermal intra-pulse frequency chirped DFB quantum cascade laser at ~7.7 μm wavelength range with ~200 ns pulse width. Making fast time resolved observations, the system simultaneously realizes high spectral resolution and range to the target, resulting in path-averaged concentration retrieval. The system performs measurements at high speed ~15 Hz and sufficient range (up to 45 m, ~148 feet) achieving a normalized sensitivity of 3.3 ppm m Hz^{-1/2} for N₂O and 30 ppm m Hz^{-1/2} for CH₄ with a 0.31 mW average power QCL. Given these characteristics, this system is promising for mobile or multidirectional search and remote detection of gas leaks.

Active Stand-Off Detection of Gas Leaks Using an Open-Path Quantum Cascade Laser Sensor in a Backscatter Configuration



Conference Title: 2016 CoRP Symposium

Author(s): David Duncan

Title: Observation error covariances in a 1DVAR retrieval applied to GMI and AMSR2

Type of Presentation: Poster

Oral

Short Abstract: In satellite data assimilation and satellite retrievals, channel errors are typically assumed to be uncorrelated. While this assumption is justifiable with respect to sensor noise, it is not for total observation error—forward model error is often highly correlated between certain channels, especially in passive microwave remote sensing. Via a novel approach to approximate forward model error, a 1D variational (1DVAR) retrieval has been developed that takes correlated forward model errors into account. This is shown to aid retrieval accuracy in cloudy and high wind speed regimes when compared to a simpler, diagonal observation error covariance matrix. Results are available for the GMI and AMSR2 sensors, however the approach is portable to any microwave imager. Retrieval output is validated against global buoy and radiosonde networks, comparing favorably against benchmark products such as those from Remote Sensing Systems and MIRS.

Conference Title: 2016 CoRP Symposium

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Title:

Precipitation trends in the Caribbean and surrounding region during the regional sea surface temperature warming period from 1982-2012

Type of Presentation: Poster
 Oral

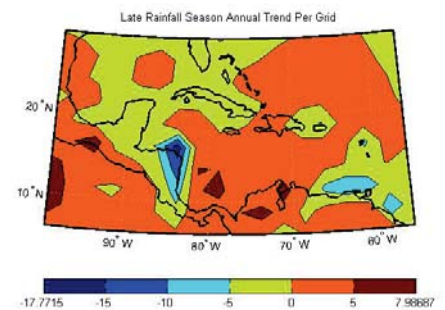
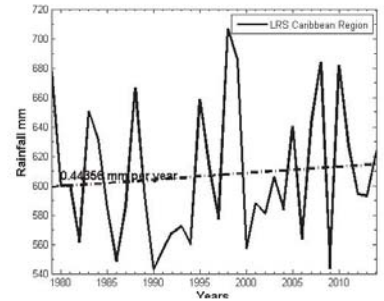
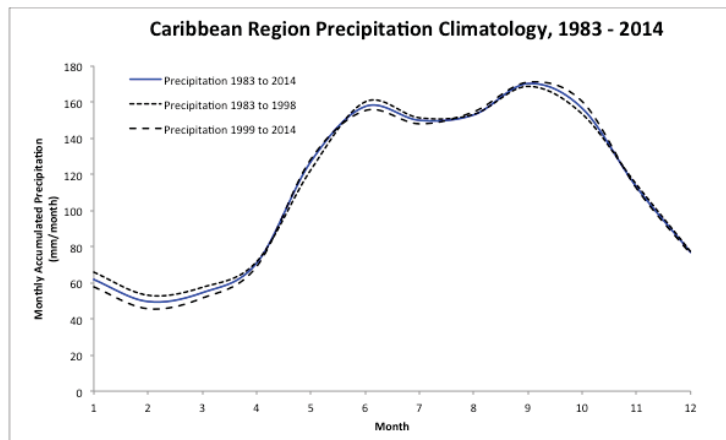
Abstract:

Precipitation trends were analyzed for the Caribbean and surrounding region for the 1982 – 2012 period. A recent warming trend of sea surface temperatures (SST) has been detected in this region for the same period, which could have potential implications for precipitation variation. Results show that SSTs are increasing annually for the region and slightly faster than the annual global rate of 0.011°C per year. The two Caribbean rainy seasons, the Early Rainfall Season (ERS) from April to June and the Late Rainfall Season (LRS) from August to November, also show an increase in SSTs for the 30-year period. Increases in SSTs during the LRS are of particular importance because temperatures during this season reach 26°C and above, which is the threshold for deep convection. Within this temperature range, the atmosphere becomes the principal modulator of thermal convection. In this way, SSTs influence Tropical precipitation. The precipitation analysis, using the Global Precipitation Climatology Project (GPCP) monthly precipitation dataset, shows that the past 15 years (1997-2012) average precipitation for the LRS has been slightly above the climatology calculated from the year 1979 to 2012. Results suggest that the observed increases in SSTs may be connected to the changes in precipitation for the same period. SST daily anomalies reflect a warming trend over the past 15 years, which further suggests the significant influence that SSTs potentially have on precipitation. During the ERS, warming SSTs in the region North of South America

and above the threshold for vertical convection were found to be highly cross-correlated (0.79) with precipitation. For the LRS, cross-correlation with precipitation and the SSTs near South America also show a high, positive cross-correlation (0.78), similar to ERS results. Our results show that the positive correlation is potentially marked by an increase in precipitation over the latter half of the period (1997-2012). Furthermore, linear and nonlinear analyses of precipitation trends reveal that the areas determined to be statistically significant are primarily over ocean versus trends observed over land.

Precipitation trends in the Caribbean and surrounding region during the recent sea surface temperature warming period, 1982-2012

- SST warming detected for the past 30 years
- Most intense warming during the past 15 years
- Rainfall increase during the LRS during the latter half of the



Conference Title: 2016 CoRP Symposium

Author(s): Andrea M. Gomez, C. Mark. Eakin, Jacqueline L. De La Cour, Gang Liu, Erick F. Geiger, Scott F. Heron, William J. Skirving, Kyle V. Tirak, Alan E. Strong, Kyle C. McDonald

Title: The 2014-2016 Global Coral Bleaching Event: Preliminary Comparisons Between Thermal Stress and Bleaching Timing and Intensity

Type of Presentation: Poster

Oral

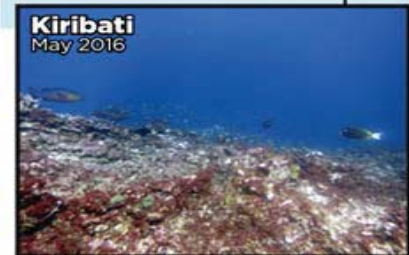
Short Abstract:

Rising ocean temperatures have increased the frequency of coral bleaching events. The extremely strong El Niño in 1997/98 triggered bleaching that killed about 16% of the world's coral. In 2010, during a mild El Niño year, elevated ocean temperatures resulted in mass bleaching events in many parts of the world. Currently during another record-strength El Niño event, another global bleaching event has been underway since mid-2014. The National Oceanic and Atmospheric Administration's (NOAA) Coral Reef Watch (CRW) is undertaking an effort to collect and document reports of the severity and extent of the ongoing bleaching event. CRW is collating bleaching data (including reports of no bleaching) from collaborators for the period 2014 through at least 2016. *In situ* bleaching observations are compared with CRW's satellite measurements of bleaching thermal stress to test CRW's thermal stress monitoring products, including the Coral Bleaching HotSpot and Degree Heating Week products. This presentation explores the timeline of record thermal stress and bleaching occurring globally from 2014-2016 based on the comprehensive *in situ* bleaching observations CRW has collected to date. Preliminary results from comparisons of bleaching patterns with CRW's satellite products will be discussed for coral reef regions around the globe.

The 2014-2016 Global Coral Bleaching Event



Andrea Gomez
The City University of New York
NOAA-CREST
(Photo Credit: Catlin Seaview Survey)



SOURCES: "Global Coral Bleaching 2014-2017" report by C.M. Eakin et al.; NOAA/Bernardo Vargas-Angel; XL Catlin Seaview Survey; InsideClimate News research

PAUL HORN / InsideClimate News

Conference Title: 2016 CoRP Symposium

Authors: Kraatz, S., Khanbilvardi, R., Romanov, P.

Affiliation: NOAA-CREST

Title: Remote sensing of river ice and ice jams using an automated algorithm with local cloud mask for MODIS and VIIRS: Application over the Lower Susquehanna River (2001-2016)

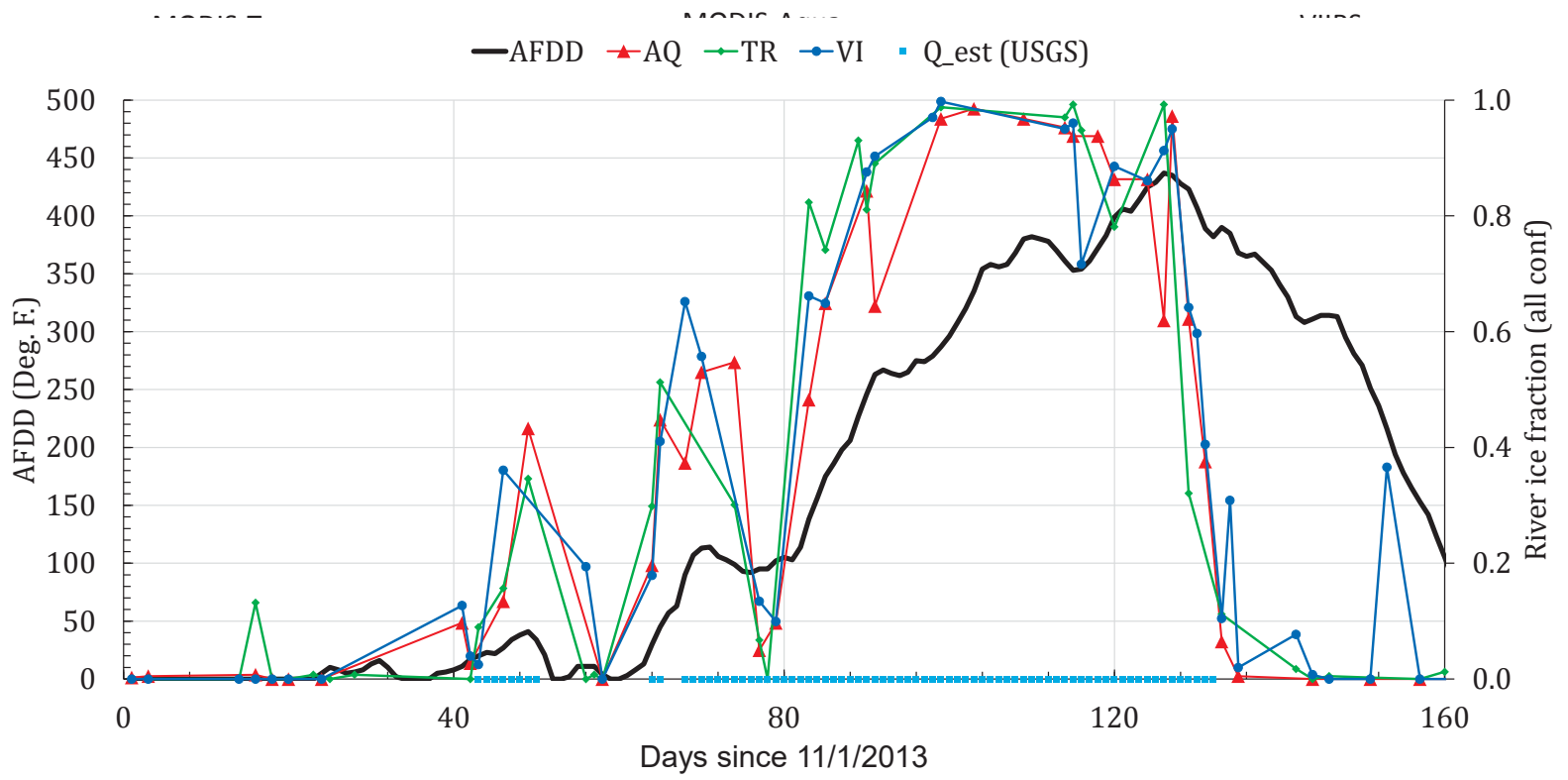
Type of Presentation: Poster

Ice jams are accumulations of smaller ice fragments and frazil which may partially obstruct the natural flow of the river when present. Ice jams are natural occurrences during the winter seasons, in particular during the freeze-up and break-up periods during which ice tends to be mobile and have a higher likelihood of forming ice dams. In severe cases, ice dams may cause the river stage to rapidly increase over a short period of time. Hence, ice jams are difficult to model and predict and potentially severe and unexpected floods may occur over a short period of time.

Satellite observations may be used to observe the river surface for indicators of ice jams. Daily river ice maps are being generated based on the CRIOS (MODIS-Terra) and VIIRS river ice algorithms that were developed at NOAA-CREST. Both algorithms rely on their respective cloud products to inform on where river ice may be observed. However due to the global nature of the cloud products errors may occur locally such as false cloud detections or detection of semitransparent clouds. In these cases it may still be possible to correctly ascertain whether ice is present or not, potentially resulting in better revisit times. For this purpose a third river ice detection algorithm, incorporating more liberal internal cloud screening, was developed. The algorithm, consisting of a threshold-based decision tree method, was applied to both MODIS platforms and VIIRS in order to map river ice and investigate/detect ice jams for a time period spanning 2001 to 2016.

Preliminary results indicate that this scheme is most effective when applied to MODIS-Aqua data, because its cloud mask appears to have a significant bias toward cloud detection when snow and ice is present. Additionally, by retrieving more grid cells when applied, the developed algorithm fulfills its purpose of providing a comparatively more liberal cloud mask. It also provides consistent ice cover results between the platforms (correlations in excess of 90% on same day observations). Reflectance difference maps are able to generally inform on ice jam locations and extent.

Remote sensing of river ice with local cloud mask (2001-2016)



Remote sensing of river ice and ice jams using an automated algorithm Application over the Lower Susquehanna River (2001-2016)

- Classification algorithm is a threshold-based decision tree type, developed from physical basis and statistical analysis (IDL)
 - Uses a land/water mask generated by multispectral max. likelihood method (ENVI/IDL)
 - Incorporates cloud masking (which is in-between that of MODIS/VIIRS overall), better than either
 - Uses 1 VIS (0.55 or 0.64 micron) + 1 SWIR (1.6 or 2.1 micron) band to discriminate
 - ice in three confidence bands
 - open water
 - snow
 - (opt. thick) cloud
 - Adaptive thresholding in case of snow cover adjacent to river
 - Viewing geometry based thresholding at VZA of 20° and 40° (MODIS only).
 - Validated by in-situ gauge, traffic camera obs. of river

Conference Title: 2016 CoRP Symposium

Author: Sean Leavor

Title: Tracking Volcanic Aerosols Using CALIPSO and HYSPLIT

Type of Presentation: Poster

Short Abstract:

Volcanic eruptions with a high stratospheric aerosol loading have a significant impact on the atmosphere. In particular, sulfur dioxide released by eruptions is linked to the destruction of ozone. Using data from the CALIPSO (Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations) satellite and the HYSPLIT (Hybrid Single Particle Lagrangian Integrated Trajectory) model, a trajectory is made for stratospheric aerosols from the February 13, 2014 eruption of the Kelud volcano in East Java. Initial points for the trajectory model are found from CALIPSO measurements, and points along the trajectory created by HYSPLIT are then compared with later CALIPSO measurements to find coincidences to help validate the trajectory. CALIPSO passes within 24 hours and 50 km of a trajectory point are labeled as coincidences. Aerosols can be characterized using the depolarization and color ratios from CALIPSO. Other satellite measurements, such as sulfur dioxide measurements from the MLS (Microwave Limb Sounder) instrument on the Aura satellite, are useful in determining the relative impact of the aerosols on the atmosphere. CALIPSO and Aura are both part of the same satellite constellation, and they pass over the same region within fifteen minutes of each other, which makes data from MLS useful for studying the aerosols.

Tracking Volcanic Aerosols Using CALIPSO and HYSPLIT

Sean Leavor, Michael Hill

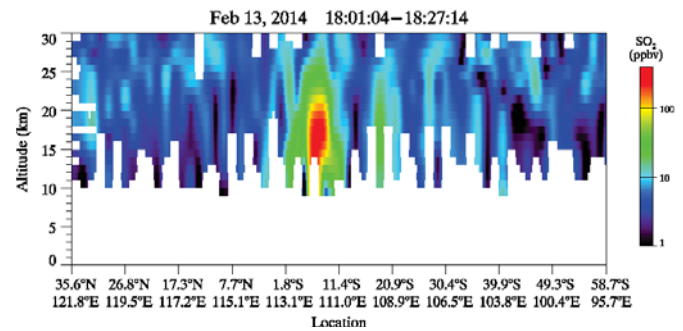
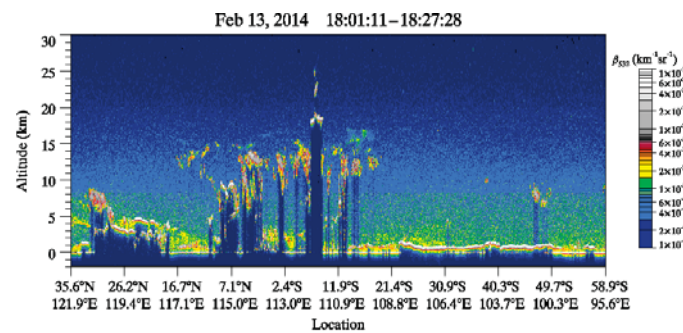
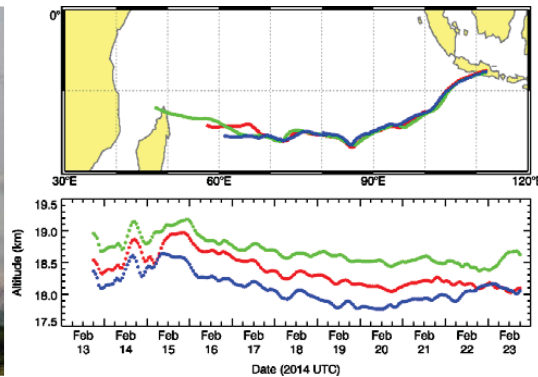
The Kelud volcano in East Java erupted on
February 13, 2014

Large quantities of SO_2 injected into the stratosphere

CALIPSO satellite data used to locate an aerosol layer

HYSPLIT trajectory model used to track the
aerosol layer

Later CALIPSO overpasses used to validate



2016 CoRP Symposium

Wilson Pena ^{1*}, Nathan Hosannah ¹, Jorge Gonzalez ¹, Yonghua Wu ¹, Fred Moshary ¹, R. Solis¹, H. Parsiani¹, M. Angeles¹, L. Aponte¹, R. Armstrong¹, B. Bornstein¹, E. Harmsen¹, L. Leon¹, D. Niyogi¹, P. Ramamurthy¹, M. Angeles¹, N. Ramirez¹.

Observations of Saharan dust long-range transport and optical properties at the Caribbean area

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² University of Puerto Rico, Mayaguez (UPRM) Campus

Poster Presentation:

A field campaign measurement was made to investigate the effects of Saharan Dust (SD) on precipitation development at Puerto Rico between June 22 and July 12 of 2015 (a midsummer drought (MSD)) when the SD transports across the tropical Atlantic Ocean often occur and reach peak concentrations. This study presents the observation-based SD optical properties and long-range transport over UPRM, which includes the data collected from a three-channel Lidar, ceilometer (Vaisala CL-51), and multiple AEROSOL RObotic NETwork (AERONET) sunphotometers at La Parguera, Mayagüez, CAPE San Juan, and Guadeloupe. The ground-based and CALIPSO lidar data show that the SD layers are mainly located below 4.0 km altitude and mix into planetary-boundary-layer (PBL) at UPRM. On the days of the SD intrusions, the aerosol optical depths (AOD) increase up to 0.6 at 500-nm while the Angstrom exponents become smaller with the range of 0.1~0.3 at the wavelength pair of 440-870 nm. Meanwhile, both high levels of MODIS-AOD and OMI-aerosol index (AI) clearly indicate the transport pattern or the zone (5°N-25°N) of the SD across the Atlantic Ocean. The NOAA-HYSPLIT model indicates that the SD at 3-km level travels for about 4-5 days for the Africa coast to the Caribbean area. In addition, the range-resolved distributions and evolution process of SD across the Atlantic Ocean will be presented; and a cap inversion caused by the SD laden Saharan Air Layer (SAL) is demonstrated, which probably inhibited convective cloud formation during the campaign.

Observations of Saharan Dust Long-range Transport and Optical Properties at the Caribbean Area

Wilson Pena ^{1*}, Nathan Hosannah ¹, Jorge Gonzalez ¹, Yonghua Wu ¹, Fred Moshary ¹, R. Solis², H. Parsiani², M. Angeles², L. Aponte², R. Armstrong², B. Bornstein², E. Hammen², L. Leon², D. Niyogi², P. Ramamurthy², M. Angeles², N. Ramirez².

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² University of Puerto Rico, Mayaguez (UPRM) Campus

Background:

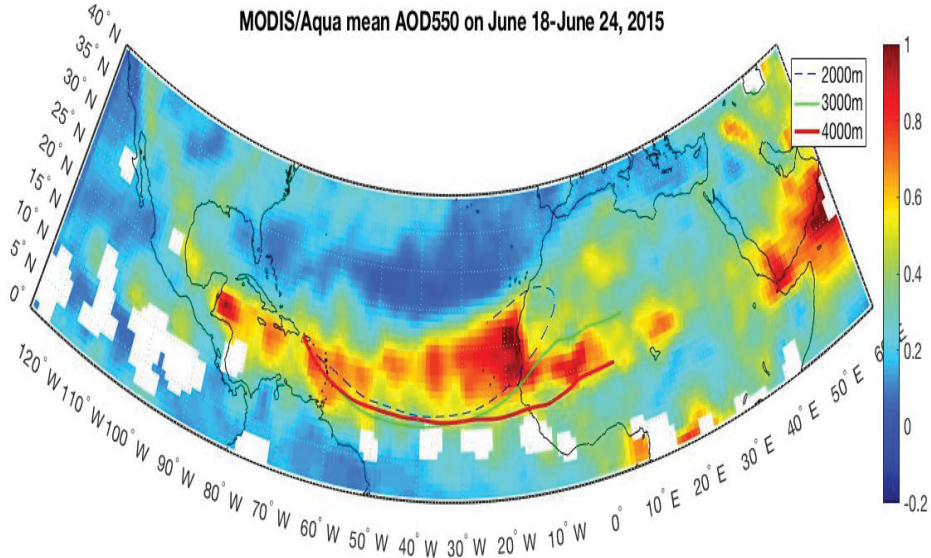
Every Summer Saharan Dust travel from Africa to Puerto causing a Summer Mid Summer Drought

Objective:

A field campaign measurement at Puerto Rico between June 22 and July 12 of 2015 presents the observation-based Saharan Dust optical properties, long-range transport and potential impact on the air quality over Puerto Rico.

Methods:

- A three channel LIDAR system
- A ceilometer
- Aerosol Robotic Network (AERONET) sunphotometers
- Satellite data: CALIPSO/CALIOF, MODIS, OMI.
- NOAA-HYSPLIT model
- Surface: hourly and daily PM10, PM2.5.



Conference Title: 2016 CoRP Symposium

Author(s): Veljko Petkovic and Christian Kummerow

Title: "Explaining Satellite Passive Microwave Rainfall Biases Over Land via Large-scale Environment"

Type of Presentation: Poster

Short Abstract:

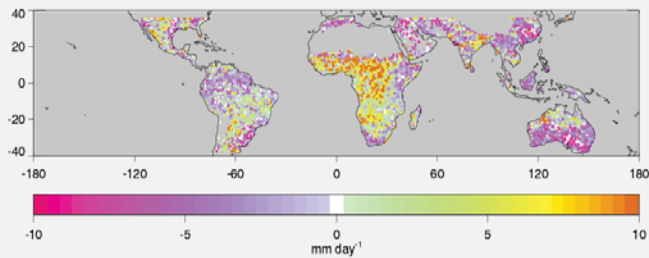
Satellite microwave rainfall retrievals currently base their land algorithms on an observed mean relationship between high frequency brightness temperature depression and rainfall rate. Sensitivity of the retrieval to changes in the amount of ice in the cloud relative to rainfall results in biases of rainfall estimates whenever a non-typical cloud structure is observed. To address these biases, we use the ERA-Interim dataset to investigate how the environmental conditions preceding the storm development relate to this ice vs. rainfall relationship. In the first part of the study, variables such as CAPE, wind shear, and vertical humidity profiles are found to be capable of predicting this ratio and removing up to 30% of the rainfall bias over regions of the Amazon and central-west Africa. These regional differences are shown to correspond well with a map of TRMM radar to radiometer biases of rainfall. They are also aligned with differences between mean reflectivity profiles of raining systems and level of convective organization in the two regions. Using these findings, in the second part of the study, we seek for improvement in the GPROF rainfall estimates in reference to ground observations over the south-east US. The Multi Radar/Multi Sensor (MRMS) ground network is utilized to address sensitivity of the satellite retrieval to its a priori database structure. Analyses are expected to reveal environmental conditions related to the differences in rain rate distributions of spaceborne and ground estimates. In addition, the links between the environment and convective regimes are expected to help the rainfall estimates when only GOES observations are available.

Explaining Satellite Passive Microwave Rainfall Biases Over Land via Large-scale Environment

Veljko Petković and Christian Kummerow



Differences between TRMM's PR and TMI daily rain rates



Revisiting the links between:

- Regional Biases of GPROF and Ice-to-Rain Ratio
- Ice-to-Rain Ratio and Precipitation Regime
- Precipitation Regime and Large-scale Environment

Abstract:

Temperature Health Index(THI): Identifying Vulnerable Populations Due to Increasing Temperatures

The Temperature Health Index (THI) is a spatial model that identifies vulnerable populations that are impacted by increased temperatures in New York City. THI is constructed from environmental and socioeconomic datasets producing a spatial product that could be insightful for a range of stakeholders such public health officials, developers and even city dwellers. The four primary layers of THI are the air temperature heat index, land surface temperature, urban vegetation and NOAA's social vulnerability layer. The model is further calibrated using New York City's hospitalization records to adjust the primary layers. The end result of this analysis will provide a detailed demographic snapshot of the populations that are impacted down to the building level resolution. The analysis could then be utilized to provide guidance to planners for mitigating the impact of increased temperatures to certain populations by recommending areas that need more vegetation. Lastly, THI will be used to develop different types of scenarios to recommend cool shelters in areas where there are the most vulnerable populations. Therefore, the primary objective of this research is to examine the impacts of THI from an interconnected perspective providing better insights into the challenges and developing solutions for mitigation.

Prefer Poster Presentation

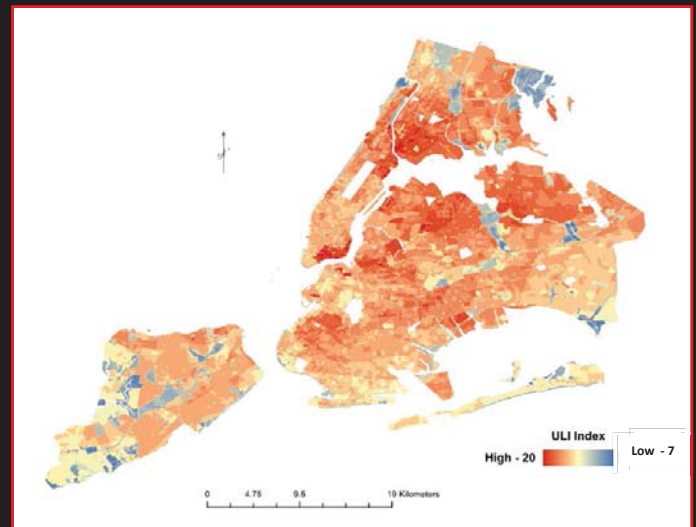
Secondary Authors: Dr. Yehuda Klein, Dr. Brian Vant-Hull and Dr. Jennifer Cherrier

Temperature Health Index(THI): Geospatial Tool for Identifying At-Risk Populations Impacted by High Temperatures in New York City

1. Explanation of environmental & Social Index Construction
2. Explanation of the Spatial Index Results in NYC

Doctoral Student: Jose L. Pillich

Advisers: Professor Yehuda Klein
Professor Brian Van/Hult
Professor Jennifer Cherrier
Professor Reza Khanbilvardi



2016 CoRP Symposium

Poster Presentation

REMOTE SENSING MONITORING OF CANADIAN WILDFIRE SMOKE AND ITS IMPACT ON BALTIMORE AIR QUALITY

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High spatial and temporal resolution Elastic *light detection and ranging* (lidar) measurements allows to monitor long-range transport of particulates, such as dust and smoke, that impact local and regional air quality. These lidar measurements enhance current knowledge and understanding on how vertical layering and long range transport of natural and anthropogenic particle pollution may alter the relationship between column aerosol optical depth and surface particle pollution concentrations. We analyze the impact and frequency of the transportation of Canadian wildfire smoke to the Mid-Atlantic. We will present a statistical analysis of data from ground based air quality monitors and remote sensing instrumentation (lidar, satellite, and sun photometer) which yield the chemical, physical, and optical properties of particle pollution during these events.



REMOTE SENSING MONITORING OF CANADIAN WILDFIRE SMOKE AND ITS IMPACT ON BALTIMORE AIR QUALITY

NOAA/CREST

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- We analyze the impact and frequency of the transportation of Canadian wildfire smoke to the Mid-Atlantic. We will present a statistical analysis of data from ground based air quality monitors and remote sensing instrumentation which yield the chemical, physical, and optical properties of particle pollution during these events.
- During the months of June-August, for the years 2009-2015, there have been approximately 30 instances (one or consecutive days) when Canadian smoke has effected Baltimore.
- **Figure 1** is an image of smoke produced by one such Canadian wildfire in June 2015.
- High spatial and temporal resolution Elastic *light detection and ranging* (lidar) measurements allows to monitor long-range transport of such particulates. The UMBC Elastic Lidar Facility was able to capture the mixing of wildfire smoke in the Planetary Boundary Layer during this case study (June 10, **Figure 2**).



Figure 1*

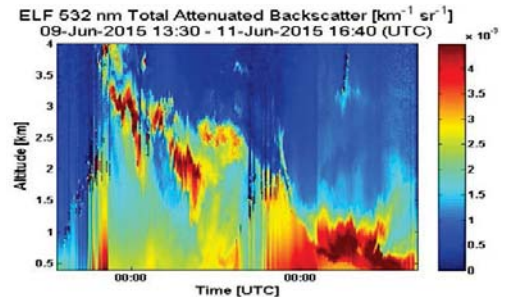


Figure 2

*photo compliments of Alberta Wildfire Info. Facebook page

Conference Title: 2016 CoRP Symposium

Author(s): Skylar S. Williams, Timothy J. Wagner, Steven A. Ackerman, and Wayne F. Feltz

Title: Water Vapor Sensing System II (WVSS-II) from Aircraft Meteorological Data Reports (AMDAR) Compared with Radiosondes Observations

Type of Presentation: Poster
 Oral

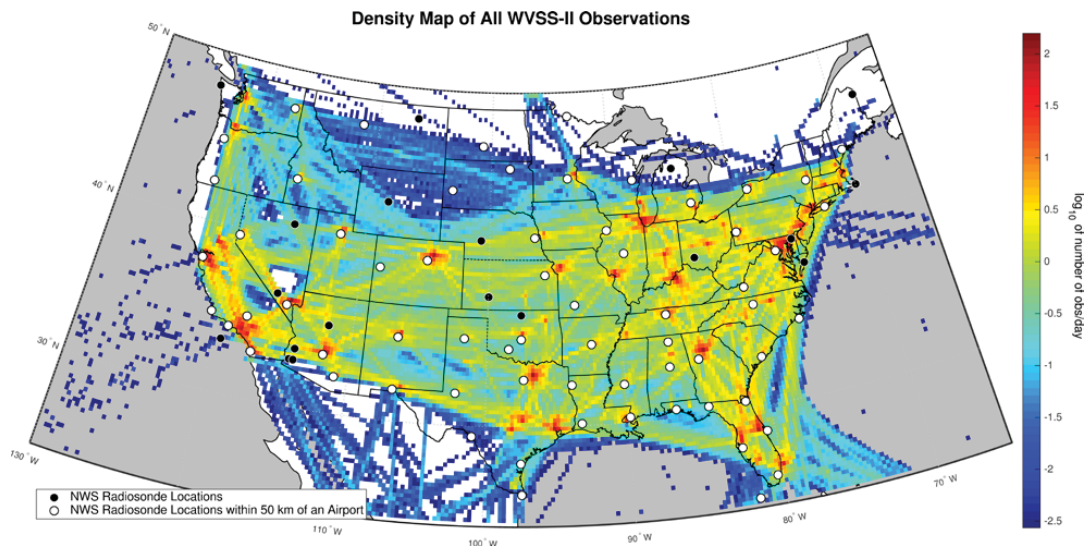
Short Abstract:

Upper air observations in the United States have traditionally been limited to radiosondes released by the National Weather Service (NWS). The radiosonde observations are released twice a day at 69 stations across the continental United States. This leads to spatially and temporally large gaps in upper air observations. One avenue to augment these observations and fill in these gaps is to use data collected by commercial aircraft during routine flights. Aircraft have routinely taken temperature, wind, and pressure observations and these data have been collected in real-time by the Aircraft Meteorological Data Reports (AMDAR) system.

Until recently, water vapor observations were not collected as these observations required a separate instrument and were not of immediate importance to flight crews as the other data are. With the development of the Water Vapor Sensing System II (WVSS-II) and its deployment aboard select aircraft, water vapor measurements have been added to this data set. This sensor is lightweight and designed to be low maintenance with high reliability. By having this additional water vapor data, complete thermodynamic and kinematic profiles of the atmosphere can be observed at a higher frequency than by radiosondes alone.

Validation studies indicated that WVSS-II shows good agreement with collocated radiosondes. However, validation of the WVSS-II has been limited to two short field validations in climatologically similar locations. In the present study, the WVSS-II is validated against operational NWS radiosonde launches creating a validation dataset that is much more spatially and seasonally diverse. By expanding the spatial comparison of the WVSS-II sensor, the sensor may be validated in multiple climate regimes and seasons allowing for the identification of potential locational and seasonal biases. Characterizing potential biases in the WVSS-II dataset will improve data assimilation processes of this data into numerical weather prediction models and create confidence for forecasting uses.

Water Vapor Sensing System II (WVSS-II) from Aircraft Meteorological Data Reports (AMDAR) Compared with Radiosonde Observations



All WVSS-II observations for 2015 with co-located radiosonde launch locations.

- Two short field experiments have taken place to validate the WVSS-II but both were located in similar climate regimes.
- This study is the basis that will allow for CONUS wide validation to occur to increase confidence of the WVSS-II in forecast operations and NWP assimilation.