A31E-0101 0830h POSTER

Modified Instrument ARUV for Automated Registration of Ultraviolet Radiation

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The automated instrument ARUV to measure the solar ultraviolet radiation (UV) was developed and built as a component of the multi-purpose monitoring system at the Division of Cosmic Rays of IZMIRAN. ARUV includes modules: (1) optical; (2) dispersion forming (grate and prizm); (3) guidance; (4) conversion of light to electronic signal; (5) registration. Modules 1 and 3 (celostat, astrosensor, photoelectrical unit, beam guidance) retain the light over the slit of the spectrometer. The optical system provides amplification by a factor of 400-500. The dispersion-forming block is installed on the industrially manufactured spectrometer STE-1 with the crossed dispersion (grate plus prizm). The inverse linear dispersion in wavelengths 350-450 nm is 0.47 - 0.64 nm/mm and the resolution is 0.01 nm. Registration is carried out by scanning over the spectrum with NMOS Linear Image sensors. The scanning covers two wavebands: 304.4 to 316.3 nm and 324.0 to 336.0 nm. The duration of scanning is less than 0.01 s, which allows us to neglect the time shift of processes with periods greater than 0.1 s. All microchips (guidance of the light beam, feedback, signal conversion, forming of the output signal, and data storage) are set up on a single plate together with NMOS Linear Image sensors. The plate is installed in the cassette of the spectrometer. ARUV can be used both in ground-based observatories and on moving vehicles (ship, aircraft). Reference. Steblova, R.S., A.V. Kulikov, V.G. Yanke, and V.G. Kartashev, The automated instrument to measure ultraviolet radiation (ARUV), EOS Trans. AGU, 76(46), F101, 1995.

A31E-0102 0830h POSTER

Using Environmental Variables to Distribute Human Populations Spatially With an Evaluation in California

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Climate change research, which focuses on anthropogenic factors, may be hampered by the lack of population data available at high spatial resolutions, particularly for developing countries or historical time periods. A refined model that distributes human populations spatially is developed and tested using California as the test case. The model is based on the concept of “habitability”. Habitability is the propensity for a place to sustain a fixed human population. Habitability is forced by environmental factors, specifically elevation, topographic accessibility, river proximity, and annual water surplus. Model-estimated population distributions are compared to 1990 California census data at the block-group level to evaluate the efficacy of the habitability model. Results show that the model can realistically distribute California’s total population based on the spatial distributions of a few environmental variables. Adding annual water surplus actually degraded the model’s performance, which implies that it may not require a hydroclimatic variable. The model does not resolve well the very-high urban densities. Although further refinement is necessary to adequately represent the urban populations, the habitability model performance suggests that it is a promising approach to population mapping, as well as to quantifying population-environment variables.

A31E-0103 0830h POSTER

Prediction of Significant Wave Heights in Extreme Storms Affecting Far North Alaska

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Barrow, Alaska is located at the northernmost point of the United States on the shore of the Arctic Ocean. The area surrounding Barrow is low lying and is thus vulnerable to coastal flooding via waves and storm surges. Previous modeling of flooding resulting from a storm that affected Barrow and the rest of the North Slope coast region in October 1963 did not reproduce observed flooding, which was substantially greater than modeled. It is hypothesized that because this model only incorporated storm surge and not waves, the model was unable to simulate the total amount of flooding. The current study examines a recent storm that affected the North Slope of Alaska on July 28-30, 2003, and includes prediction of wave height using the SWAN (Simulating WAves Nearshore) model. In addition this study considers the formation and development, climatological context, and community responses for this storm. Results from the wave modeling portion of this study will be incorporated into a coastal flooding model in order to better simulate the coastal environment under extreme conditions in this area.

A31E-0104 0830h POSTER

Climate Response to Large-Scale Wind Farms

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Enhanced reliance on wind energy is one of the possible ways to solve the greenhouse gas problem. However, because wind farms modify the interaction between atmosphere and surface, there is a possibility that wind energy might also change the global climate if developed on a scale large enough to make material reductions in greenhouse emissions. To investigate possible effect of large wind farm arrays on climate, we used a version of GFDL AGCM with prescribed climatological SST and ice extent. A series of 20-year integration included a range of spatial coverage and several different parameterizations for wind farms, as well as controls. Presented here are the results of the experiments with the largest wind farm arrays considered, where significant parts of Europe,North America, andChinaare covered. The total wind farm area in this case is about 10% of land surface; the resulting dissipation of kinetic energy on wind farms ranges from 12 to 19 TW (compared to current global primary energy consumption of 12 TW). The results of the simulations show similar effects on climate despite differences in parameterization for the wind farms. The global-average climate reaction is negligible, but regional effects are not. The effect of wind farms on annual mean surface air temperature reaches a regional maximum of the order of 1 degree, which is smaller than the 2XCO2 signal. The temperature response is strongest inEurasia, where it is characterized by cooling in northern mid-latitudes of entire continent and warming in the South in all seasons except JJA, when the pattern is much weaker. The response of precipitation does not show an obvious large-scale pattern and is likely to be statistically not significant.

A31F MCC: 3001-3003 Wednesday 1020h

Bjerknes Lecture *(joint with B, OS, GC)*

A31F-01 1025h INVITED

What atmospheric oxygen measurements are telling us about the carbon cycle

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Direct observations of changes in the oxygen content of the atmosphere have now been underway for more than a decade. The data reveal a rich spectrum of variabilty on seasonal and interannual time scales that are diagnostic of rates of photosynthesis and respiration in the land and marine biospheres and of rates of mixing and transport in the ocean and atmosphere. This paper will discuss how the oxygen data can be utilized, together with atmospheric CO2 data, to help separate land and oceanic contributions to CO2 variability and to provide a new window for resolving secular changes in ocean biogeochemistry. The paper will also highlight the expanding experimental capabilities for measurements of oxygen and related tracers.

A31G MCC: 3018 Wednesday 1020h

Chemistry and Dynamics of the Upper Troposphere and Lower Stratosphere II *(joint with SA, AE)*

Presiding: **M Ross,** Aerospace Corp.**;** **M Zondlo,** Southwest Sciences

A

A31G-01 1020h

Evidence of the Effect of Summertime Midlatitude Convection on the Subtropical Lower Stratosphere: An Analysis of Tracer Measurements From the CRYSTAL-FACE Mission

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Correlations of long-lived trace gases measured during the CRYSTAL-FACE mission are used to examine mixing in the summer subtropical lower stratosphere. A large number of particles produced by biomass burning were measured in the lower stratosphere up to potential temperatures of 390 K. The particle measurements, combined with the large scale circulation, suggests recent injection of midlatitude tropospheric air into the lower stratosphere. Fractions of midlatitude tropospheric air in the lower stratosphere are calculated based on consistency between all of the tracer-tracer correlations. The tropospheric endpoints to the mixing estimates give an indication of midlatitude continental convective input into the lower stratosphere. Radiative heating rates in the summer subtropical stratosphere above roughly 360 K are positive which suggests that this region will rise and thus, the midlatitude convective input will have an effect on the composition of the stratosphere as a whole.

A31G-02 1035h

Stratospheric Water Vapor and the Asian Monsoon: An Adjoint Model Investigation

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