A71B-0112 0830h POSTER

Test of the Transmission Line Model and the Traveling Current Source Model with Triggered Lightning Return Strokes at Very Close Range

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We test the two simplest and most physically different return stroke models, the transmission line model (TLM) and the traveling current source model (TCSM), by comparing model-predicted electromagnetic field waveforms and field derivative waveforms at 15 m and 30 m from triggered lightning return strokes with the first microsecond of comparable measured waveforms. In the TLM, the return stroke process is modeled as a current wave starting at the base of the lightning channel and propagating upward along the channel with constant waveshape and constant speed, as if the channel were a transmission line. In the TCSM, the return stroke process is modeled as a current source traveling upward with a constant speed and injecting a current wave (derived from the dart leader charge) into the channel which propagates downward with the speed of light and terminates on ground without reflection. The electric and magnetic fields were calculated from Maxwells equations given the temporal and spatial distribution of the channel current specified by the return stroke models. Electric and magnetic fields and their derivatives were measured 15 and 30 m from rocket-triggered-lightning during the Summer of 2001 at the International Center for Lightning Research and Testing at Camp Blanding, Florida. We present data from a five return stroke flash, S0105, and compare the measured data with model-predicted results for three assumed lightning return stroke speeds, v = $1x10^8$ m/s, v = $2x10^8$ m/s, and v = $3x10^8$ m/s (the speed of light). The results presented show that the TLM works reasonably well in predicting measured electric and magnetic fields if return stroke speeds during the first microsecond are chosen to be between $1x10^8$ m/s and $2x10^8$ m/s, and works even better for the field derivatives for return stroke speeds near $2x10^8$ m/s. The TCSM does not adequately predict the measured close electric fields and close electric and magnetic field derivatives during the first microsecond. On theoretical grounds, the TLM might be expected to give better results than the TCSM for return stroke propagation along a dart leader channel that is conducting but contains no net charge density. Perhaps the bottom 100 to 200 m of the channel produced by the triggered-lightning dart leader and traversed by the return stroke in the first microsecond or so of return stroke propagation indeed has a low charge density because the corona sheath surrounding the dart leader has insufficient time to develop at the bottom of the dart leader.

A71C MCC: Hall D Sunday 0830h

Coupling of Iron in the Atmosphere and Ocean Posters *(joint with B, OS)*

Presiding: **P Ginoux,** NASA Goddard Space Flight Center**; W Gregg,** NASA Goddard Space Flight Center

A71C-0113 0830h INVITED POSTER

Incorporating Iron Dynamics into a 3D Ocean Biogeochemical Model

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Iron biogeochemistry has been incorporated into the ocean component of the NCAR Community Climate System Model (CCSM). The ecosystem model of Moore et al. (2002), which includes explicit iron cycling within the upper ocean ecosystem, has been embedded into the 3D POP ocean model component of the CCSM. The ecosystem model includes multiple phytoplankton functional groups and allows for multiple potentially limiting nutrients. Phytoplankton growth rates may be limited by available nitrogen, phosphorus, iron, silicon (diatoms only), and/or light levels. Iron / carbon ratios vary between phytoplankton groups and as a function of iron availability. Phytoplankton functional groups incorporated into the model include diatoms, coccolithophores, nitrogen-fixing diazotrophs, and a generic small (pico- nano-sized) phytoplankton group. This presentation will focus on how iron influences ecosystem community structure as a key limiting nutrient and how iron cycles in the upper ocean. The model includes an atmospheric source for iron from mineral dust deposition and a sedimentary source for iron in shallow water regions. The relative roles of these two iron sources will be examined. Residence times and iron budgets for surface waters and in the upper ocean will be estimated from the model output.

A71C-0114 0830h POSTER

Modeling the Influence of Different Processes on Iron Solubilization in Mineral Aerosols: From the Gobi Desert to the North Pacific Ocean

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Atmospheric transport is the only known means to deliver dissolved iron from the continents to remote oceanic areas. Dissolved iron is one of the necessary nutrients for photosynthesis of microscopic, single-celled marine organisms (phytoplankton) that grow abundantly in oceans around the world. Alteration of dissolved iron fluxes may substantially affect ocean ecosystem productivity and even exert a global-scale influence on climate by affecting the rate at which atmospheric CO2 is fixed by oceanic biota. On continents, iron mainly exists in forms of highly insoluble minerals (iron-oxides and iron-aluminosilicates) and the processes that can solubilize iron in mineral aerosols during their long-range transport remain poorly understood. In this work we attempt to elucidate the key processes that control the solubilization of iron in mineral aerosols using a simple Lagrangian box model to simulate the transport and chemical alteration of iron-containing mineral aerosols as they are transported from the east coast of China to the remote western North Pacific Ocean. Model parameters and initial conditions are set using a combination of soil and aerosol data from the Gobi Desert, as well as from measurements made during specific PEM-West B flights that encountered dust storm plumes over the Pacific Ocean that had originated in China. Our preliminary results indicate that the amount of acidic pollutants in the air along the dust transport pathways can have a significant effect on the amount of iron that is solubilized in advecting mineral aerosols. This suggests that there may be a link between the flux of the dissolved iron to the remote North Pacific Ocean and the rate at which pollutants such as sulfur dioxide, nitrogen oxides, and ammonia are emitted in East Asia.

A71C-0115 0830h INVITED POSTER

Iron and Ecosystem Response to Surface Ocean-Lower Atmosphere Interactions in the North Pacific Ocean Gyre

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Here, we report measurements of iron and aluminum in surface and subsurface waters during March and May of 2001 on transects between central California and Hawaii. A large cloud of Asian dust was detected during April 2001 and there was a clear signal in surface water iron due to aerosol deposition on the May transect. Iron and aluminum concentrations increased synchronously by 0.5 and 2 nM along the southern portion of the transect from background values in March (0.1 to 0.2 nM Fe). Elevated iron concentrations were found to a depth of 100 m. These changes occurred in a ratio that is close to the crustal abundance ratio of the metals, which indicates a soil aerosol source. Soil aerosol concentrations along the transect were estimated using the real-time Navy Aerosol Analysis and Prediction System (NAAPS). The NAAPS results and direct observations of aerosol iron concentration at Mauna Loa Observatory on Hawaii indicate low aerosol concentrations near Hawaii and a large meridional gradient with maximum concentrations in the boundary layer north of 30° N. However, the change in surface water iron and aluminum concentration was highest south of 25° N, near Hawaii. This suggests that the iron and aluminum concentration changes were the result of local processes, rather than a reflection of the broad-scale distribution of aerosol. Anomalously low wind velocities (1 m/s) at the start of the May transit produced a thin (5-10 m), warm surface layer. We suggest that this trapped aerosol at the surface during daylight and led to the iron concentration increase, perhaps through photochemical reduction of particulate iron. Iron concentrations then decreased to background on the day that trade winds returned. A mass balance calculation suggests that the solubility of aerosol iron would have to be near 100% to support the observed increase during the 5 day period of low winds. The absence of a significant increase in particulate iron concentration lends support. While the aerosol fluxes are not well enough constrained to make this conclusion completely robust, it seems most consistent with the observations. There are only weak signals in the biological parameters we monitored (variable fluorescence, chlorophyll concentration, *Trichodesmium* cell abundance or macronutrients) that corresponds to the iron concentration change. However, there may not have been sufficient time for the ecosystem to respond to the effects of iron deposition in oligotrophic waters.

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A71C-0116 0830h POSTER

Atmospheric Transport and Input of Iron to the Southern Ocean

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While Australia is not generally considered to be a major source of mineral dust to the atmosphere, at least compared to Asian and African desert regions, it does appear to be the main source of mineral material to the Southern Ocean region south of Australia and New Zealand. In common with most of the greater Southern Ocean, this region contains high nitrate, low chlorophyll (HNLC) waters. Recent open ocean iron enrichment experiments in this region have demonstrated that phytoplankton growth and biomass are limited by iron availability. However the flux of atmospheric iron to this open ocean region is poorly known with very few direct measurements of mineral aerosol levels and input.

Using mineral aerosol samples collected on Macquarie Island and at Cape Grim, together with other chemical data, air mass trajectories and satellite data, the spatial and temporal variability of aerosol iron transport and input to the Southern Ocean region south of Australia is estimated.

A71C-0117 0830h POSTER

Coupled Iron-Phosphorus Cycling in Surface Seawater Mediated by Photoreduction of Fe-rich Dust

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Nutrient concentrations are exceedingly low in the oligotrophic waters of the open ocean. One source of the micronutrient iron (Fe) to these regions is deposition of continentally-derived dust. Photolytic reduction of Fe is believed to be a key process in rendering bioavailable the Fe present in dust particles delivered to surface seawater. Fe(III)-oxyhydroxides, in general, have a strong affinity for sorption of phosphate, and Fe-oxyhydroxides present in dust derived from continental soils can be highly enriched in phosphate. Therefore, solubilization of Fe(III) phases via photoreduction may liberate phosphate to surface seawater. Because biological productivity in oligotrophic regions of the open ocean can be limited by phosphate as well as by iron, this process could be an important avenue for providing two essential, limiting nutrients to support primary productivity in these regions. Alternatively, if Fe-rich

dust delivered to surface waters has unsaturated surface sorption sites, dust may actively scavenge phosphate from surface waters, pushing the system further toward phosphate limitation. Depending upon the balance between these two processes, continentally derived dust may either partially alleviate or enhance phosphate limitation in oligotrophic waters. We will present results of experiments designed to determine whether phosphate-containing Fe(III)-oxyhydroxides, subjected to photoreduction, release phosphate to seawater. In a series of incubation experiments, synthetic iron minerals (ferrihydrite, goethite) and natural dust samples (Saharan dust, Chinese loess) are suspended in artificial seawater and exposed to sunlight in the presence/absence of citrate. We observe an increase in both dissolved Fe(II) and Fe(Total) during daylight hours, which we attribute to the photoreduction process. Fe concentrations are at least 5 times higher in the presence of citrate, consistent with other studies exploring the effect of organic ligands on the Fe-photoreduction process. Phosphate sorbed onto synthetic ferrihydrite appears to enhance the release of Fe during photoreduction. The net effect of this process on dissolved phosphate is still being evaluated.

A71C-0118 0830h POSTER

The Impact of Aeolian Iron Deposition on the Indian Ocean Ecosystem

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The aeolian deposition fields from two separate atmospheric models of mineral dust transport have been applied as iron flux boundary conditions to a fully coupled, 3-D bio-physical ocean general circulation model of the Indian Ocean. The atmospheric transport models are those of Tegen and Fung (1994, hereafter the GISS model) and the GOCART model of Ginoux et al., (2001). The biological portion of the ocean model is a 9-component pelagic ecosystem, consisting of a large and small size class for phytoplankton, zooplankton and detritus, as well as three phytoplankton nutrients (nitrate, ammonium and iron). The model ecosystem has been extensively validated with data from the US JGOFS Arabian Sea Process Study, the NODC seasonal nitrate climatology, and a monthly climatology of SeaWiFS ocean color. The GISS model shows order of magnitude higher aeolian iron fluxes northwest of Australia, while the GOCART model shows similar differences over the Arabian Sea during the winter monsoon and spring intermonsoon. Furthermore, differences in iron flux distribution patterns over the Arabian Sea during the summer monsoon are profound. One new insight from climatological solutions with both deposition fields is that iron limited phytoplankton growth prevails over much of the southern Indian Ocean. Another is that the Arabian Sea undergoes a seasonal cycle whereby iron limitation develops during the summer monsoon and iron replete conditions are reestablished during the subsequent winter monsoon and spring intermonsoon, though the specific distribution patterns between the two solutions are significantly different. These differences extend to the spatial distribution of phytoplankton blooms in the central Arabian Sea during the summer monsoon. Finally, interannual variability of these summer blooms, in model simulations forced with interannually varying winds, precipitation and aeolian iron flux, is compared to interannual variability in SeaWiFS ocean color observations.

A71C-0119 0830h POSTER

Atmospheric Iron Flux and Surface Chlorophyll at South Atlantic Ocean: A Case Study Near Patagonia

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Iron is a limiting nutrient for ocean biologic activity. We present a method to quantitatively address the response of ocean biology to inputs of atmospheric Fe associated with atmospheric dust. Ocean color satellite observations and the global distribution of dust aerosol from GOCART model are combined to evaluate the influence of sea surface iron flux in marine biogeochemistry. We analyze the correlation between Fe deposition from this 3-D atmospheric model and a proxy for oceanic biological activity, remotely sensed ocean color. We present a time series anomaly correlation analysis and a spatial objective analysis to explore the response between the dust deposition and SeaWiFS data for 2000-2001 in the Southern Hemisphere.

Several regions between 40o S and 60o S, off the Patagonian coast in the Atlantic Ocean, have correlation coefficients from 0.6 to 0.95, significant at the 0.05 level. The spatial distributions of Fe flux and ocean color are studied in terms of the patterns of meridional band center of mass (CM) coupled with inferences about ocean surface transport. Such patterns of CM indicate that ocean color may be transported to different latitudes than where Fe input occurs. Chlorophyll patterns show a meriodional migration reaching the southernmost position in January-February, and then they start to move northward until a strong co-location occurs in May. The Chlorophyll north-south oscillation allows both fields coincide again in July-August. Several processes (river runoff, oceanic downwelling or upwelling) can affect the annual cycle of primary productivity and sources of iron in the upper ocean, however the time series and CM spatial patterns suggest the atmospheric iron flux as a main factor in regional biogeochemistry.

A71C-0120 0830h INVITED POSTER

Aeolian Iron Deposition and Its Potential Linkage to Phytoplankton Biomass: A Case Study in the North Pacific

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Recent iron (Fe) fertilization experiments conducted in the equatorial Pacific, Southern Ocean and sub-Arctic Pacific provide strong evidence to support the hypothesis that Fe, a micronutrient, plays an important role in regulating phytoplankton growth in the ocean. As the major source of Fe in the surface waters of certain open ocean regions is dust deposition, characterization of aeolian Fe input is needed to better understand the oceanic biogeochemical cycles. Recent modeling results show that the air-to-sea fluxes of aeolian Fe are non-uniformly distributed, with high Fe fluxes occurring in the low and mid-latitudes in the Northern Hemisphere. The aeolian Fe fluxes to certain oceanic basins also vary with seasons, reflecting the seasonal transport of dust from the deserts in the continents. In addition, the dissolved atmospheric Fe, which is closely related to Fe bioavalability, is delivered to the ocean largely by wet deposition, highlighting the importance of precipitation. This implies that aeolian Fe input through precipitation scavenging could relate to episodes of high surface ocean productivity at least in certain oceanic regions, and the supply of dissolved Fe through wet deposition may cause natural iron fertilization in the ocean. This presentation will take a close look at the North Pacific, in particular the mid-latitude region, which is strongly influenced by the springtime transport of Asian dust. Results and discussions will focus on the basin-wide distributions of Fe in the marine atmospheric boundary layer, the comparisons of the air-to-sea deposition rates of Fe at different latitudes, the chemical and physical properties of Fe-containing dust particles, and the aeolian Fe deposition-surface ocean chlorophyll relationship.

A71C-0121 0830h POSTER

Looking for iron deposition responses in the ocean: use of model and satellite data

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Evaluation of the importance of mineral aerosol deposition in controlling open ocean iron availability is hampered due to very few direct observations of desert dust deposition, in addition to uncertainties in the processes responsible for the uptake and usage of iron in ocean biota. Here we focus on understanding whether model based simulations of mineral aerosols can assist in providing estimates of desert dust deposition, both absolute magnitudes and timing. We examine the relationships between satellite retrievals of aerosol optical depth and desert dust deposition. Analysis of both in situ as well as satellite observations of ocean responses to desert dust deposition are used in this study. Our goal is to provide a robust methodology for looking for the ocean response to iron deposition, and examine available evidence for the importance of mineral aerosols for providing iron to the open ocean ecosystems.

A71C-0122 0830h POSTER

Quantification of Iron Oxides and Hydroxides in Desert Aeolian Particles

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Long range transport of desert dust over oceans constitute a source of iron for the surface water. Assessing the iron cycle and its biogeochemical implications in oceanic areas requires determination and quantification of the iron status in aeolian particles. Indeed, in such aerosols, the iron is either trapped in the silicate structure or present under the form of oxides and hydroxides (free iron).

We propose a method to apportion iron between free and entrapped forms in mineral aerosols. It consists in the adaptation of a well known method used for soil characterization to the treatment of aerosol samples, which represent less than 1 mg of material collected by air filtration on polycarbonate filters. The iron oxides and hydroxides are extracted selectively using the combined action of reductive and complexant agents in a buffered solution. The iron content is measured before and after this chemical extraction using X ray fluorescence spectrometry. We attempt to give some values for three main desert source areas using aerosol samples collected near Niamey (Niger) either during Harmattan events or during local erosion events, and samples collected downwind of the Gobi desert in China.

Results emphasize firstly that iron trapped in the structure of silicate minerals represents an important part of total iron content. This suggests that, regarding dissolution processes in sea water, total elemental iron content of aeolian dust can not be used directly to calculate the flux of iron available. Secondly, our results show that the free iron content vary according to the origin of dusts. Niger samples have contents in free iron of 4.4 % (SD = 0.8) for local erosion and 2.8 % (SD = 1.0) for Harmattan. Chinese samples contain 3.7 % (SD = 0.5) of free iron. These differences could be linked to the parent soil mineralogical composition that varies with geographical location, but for some of our samples it also could be linked to a size fractionation process occurring first during the aerosol production in source area then during the transport of particles at a regional scale. Regarding this, indications drawn from measurements of size resolved free iron content will be discussed.

A71C-0123 0830h POSTER

Controls on Deep Water Iron Distribution: A Modeling Study

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Waters upwelling to the surface ocean are often deficient in iron relative to other nutrients. The extent of this deficit, and whether it may be compensated locally by aeolian deposition, depends upon the balance of ocean transport and biogeochemical mechanisms. We formulate and examine models of the oceanic cycling of

iron and its control on export production and macro-nutrient distributions. We formulate parameterizations of iron cycling in the deep ocean based on current understanding of possibly important mechanisms and constrained by the observed oceanic distribution of dissolved and particulate iron.

We first examine these parameterizations in the framework of a highly idealized six-box ocean biogeochemistry model incorporating coupled phosphorous and iron cycles and a prescribed aeolian deposition of iron. Export production is parameterized simply,limited by light, phosphate, and iron availability in the surface ocean. We compare parameterizations of the deep water, geochemical processes affecting iron based on scavenging and redissolution of iron, analogous to the inferred properties of thorium; and complexation, the binding of iron to organic ligands.When complexation is not represented the scavenging-redissolution model can reproduce the observed, basin to basin, deep water gradients of iron when scavenging and redissolution rate constants are in a ratio of approximately 1:100. The introduction of a strong ligand into the box model changes the balance, reducing the significance of redissolution. The observed deep water gradients are again reproducible when an appropriate and plausible ligand binding strength is applied. In agreement with observations, the model suggests that over 95% of the "dissolved" iron is organically bound and predicts the presence of excess, uncomplexed ligand. Deep water Fe gradients in the model are sensitive to the scavenging rate and total ligand concentration but the observed iron distribution can be reproduced with a broad range of plausible parameter values.

We use the results from the box model study to guide parameter choices and apply the iron biogeochemistry model in the more complex setting of an ocean general circulation and biogeochemistry model. Again, the surface phosphate distribution and export production are actively controlled by the availability of iron. The model can reproduce the broad characteristics of the known oceanic iron distribution and maintains high surface phosphate concentrations in known "High Nutrient Low Chlorophyll" regions. More extensive observations of the oceanic iron distribution and greater understanding of the nature and role of the organic ligands are needed in order to better constrain and verify such models.

A71C-0124 0830h POSTER

Does the Pacific Equatorial Undercurrent bring Iron into the HNLC region?

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The enrichment of iron in the Pacific Equatorial Undercurrent (EUC) has often been attributed to the submarine volcanic activity in the region around New Guinea and to the Sepik river discharge laden with iron rich sediments. A fully coupled biological ocean general circulation model (BOGCM) is employed to study the effects of iron injection from these two sources. The volcanic source is modeled as a continuous injection at 145E of 8 micromoles/m2/d at various depths. The most efficient place to enrich the euphotic zone in the central eastern Pacific is found to be around 125m near the core of the EUC. An increase in annual mean net community production of 15-25% is acheived with an increase of nitrate uptake by nearly 1 mmol/m3. The Sepik river discharge is modeled as an estuarine flow with mass flow into the ocean in one layer and an equal outflow in the layer below with specified salinity and iron concentrations. Details of the shelf flow are neglected for this idealized study. The near surface flow off Sepik river is northwestward which then joins the eastward flow near the equator. Similar to the volcanic iron injection, the riverine iron input also appears to be more efficiently transported eastward and upwelled in the euphotic zone of the HNLC region when the input is near depths of 125m. The Sepik river outflow is greatly reduced during warm ENSO events. However, due to a lack of interannual time-series of the discharge data, we employ climatological river inputs. The details of the interannual simulations from are discussed including the effect of the western Pacific iron sources on decadal variability of the tropical Pacific ecosystem.

A71D MCC: Hall D Sunday 0830h

Fine-Scale Vertical Structures in the Upper Troposphere/Lower Stratosphere and Their Roles in Climate and Weather Processes: Hypotheses, Observations, and Models I Posters

Presiding: **M de la Torre Jurez,** Jet Propulsion Laboratory

A71D-0125 0830h POSTER

The tropopause region revealed by lidar and dropsonde observations

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A composite of different observational tools are applied to explore the fine-scale structure of the tropopause region under a variety of meteorological conditions. Differential absorption lidar (DIAL) observations along extended flight tracks above the Atlantic Ocean reveal complex structures in the measured water vapor field. Mesoscale features like deep tropopause folds close to cyclones as well as stratospheric intrusions of much smaller horizontal and vertical scale are studied. In order to identify their origin and to understand their relationship with synoptic-scale meteorological systems numerical simulations with the NCAR weather prediction model MM5 are performed. Dropsonde measurements of the temperature and wind field in the vicinity of intense cyclones above the Pacific Ocean during NORPEX98 reveal wave-like structure below and above the core of the subtropical jet stream. The dropsonde data are compared with mesoscale numerical simulations and the source of these wavelike structures is discussed. The observations presented in this paper are restricted to altitudes below 12 km. Future field campaigns will be designed to investigate also the height range above this altitude.

A71D-0126 0830h POSTER

Breaking Gravity Waves Over Large-Scale Topography

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The importance of mountain waves is underscored by the numerous studies that document the impact on the atmospheric momentum balance, turbulence generation, and the creation of severe downslope winds. As stably stratified air is forced to rise over topography, large amplitude internal gravity waves may be generated that propagate vertically, amplify and breakdown in the upper troposphere and lower stratosphere. Many of the numerical studies reported on in the literature have used two- and three-dimensional models with simple, idealized initial states to examine gravity wave breaking. In spite of the extensive previous work, many questions remain regarding gravity wave breaking in the real atmosphere. Outstanding issues that are potentially important include: turbulent mixing and wave overturning processes, mountain wave drag, downstream effects, and the mesoscale predictability of wave breaking.

The current limit in our knowledge of gravity wave breaking can be partially attributed to lack of observations. During the Fronts and Atlantic Storm-Track Experiment (FASTEX), a large amplitude gravity wave was observed in the lee of Greenland on 29 January 1997. Observations taken collected during FASTEX presented a unique opportunity to study topographically forced gravity wave breaking and to assess the ability of high-resolution numerical models to predict the structure and evolution of such phenomena. Measurements from the NOAA G-4 research aircraft and high-resolution numerical simulations are used to study the evolution and dynamics of the large-amplitude gravity wave event that took place during the FASTEX. Vertical cross section analysis of dropwindsonde data, with 50-km horizontal spacing, indicates the presence of a large amplitude breaking gravity wave that extends from above the 150-hPa level to 500 hPa. Flight-level data indicate a horizontal shear of over 10-3 s-1 across the breaking wave with 25 K potential temperature perturbations. This breaking wave may have important implications for momentum flux parameterization in mesoscale models, stratospheric-tropospheric exchange dynamics as well as the dynamic sources and sinks of the ozone budget. Additionally, frequent breaking waves over Greenland are a known commercial and military aviation hazard.

NRL's nonhydrostatic COAMPS^{TM} model is used with four nested grids with horizontal resolutions of 45 km, 15 km, 5 km and 1.67 km and 65 vertical levels to simulate the gravity wave event. The model simulation captures the temporal evolution and horizontal structure of the wave. However, the model underestimates the vertical amplitude of the wave. The model simulation suggests that the breaking wave may be triggered as a consequence of vertically propagating internal gravity waves emanating from katabatic flow near the extreme slopes of eastern Greenland. Additionally, a number of simulations that make use of a horizontally homogeneous initial state and both idealized and actual Greenland topography are performed. These simulations highlight the sensitivity of gravity wave amplification and breaking to the planetary rotation, slope of the Greenland topography, representation of turbulent mixing, and surface processes.

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The Stratospheric Aerosol and Gas Experiment: Early Results

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The Stratospheric Aerosol and Gas Experiment is a key part of NASAs Earth Observing System (EOS). SAGE IIIs role within EOS is to provide high resolution, vertical profiles of atmospheric constituents including ozone, aerosol, water vapor and temperature from the middle troposphere through the stratosphere that are crucial to understanding climate change.

The instrument was launched on a Russian Meteor-3M spacecraft on December 10, 2001 from the Baikonur Cosmodrome in Kazakhstan. Routine measurements began in late February 2002. Retrieval results for the different species from both solar and lunar occultation measurements will also be shown with comparison satellite observations from SAGE II, HALOE, and POAM III. These initial results show that, despite several instrument and platform related problems during the early operational period, the instrument is performing well. These results include data products that were not a part of previous SAGE missions such as using the oxygen A band to retrieve temperature and pressure and the use of lunar occultation to derive profiles of ozone, NO2, and NO3.

URL: http://www-sage3.larc.nasa.gov/

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Estimation of stratospheric intrusions along GOES-derived humidity gradients with a statistical model

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A robust correspondence between lidar-observed tropopause folds and strong GOES-derived spatial gradients in humidity is used to calibrate a predictive model for the occurrence of tropopause folding in the GOES-East and West extratropical field of view. Humidity gradients are retrieved from the Altered Water Vapor product, a derived product depicting upper-tropospheric specific humidity based on a correction to the GOES water vapor channel. Spatial gradients of humidity above a certain threshold correspond to tropopause breaks, which are seen to associate consistently with tropopause folding and stratospheric intrusions that result in a layering of stratospheric-type air in the free troposphere. In-flight ozone lidar from