

## A71E-03 0900h INVITED

## Lessons on Dust Emissions Derived from Experimentation and Development of a Model for Owens (dry) Lake, CA Dust Emissions

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Dust storm forecasting requires modeling of the vertical flux of wind erosion resuspension particles smaller than 10 micrometers (Fa) that is verified by measurement. Experiences in modeling and measurement of Fa over several years at Owens Lake, a large dust-source area in California, may be given in the form of lessons.

The first of these lessons is the inhomogeneity of emissions over the lake surface. The inhomogeneity changes with time so that the positions of "hot spots" on the lake surface move in time even though the surface sediment texture and composition remains almost constant. A second lesson is that parts of the lake almost never produce dust. In fact, of the more than 200 square km surface of the lake, the potentially dust-emitting dry lake bed is almost always smaller than 130 square km. A third lesson is that although there were brief periods during which Fa was not coupled with sand movement (that is PM10 emissions were directly suspended without the mechanism of sandblasting) the overwhelming dominant dust production mechanism was sandblasting. That is, the vertical flux of dust Fa was proportional to the horizontal flux of sand q; i.e.  $Fa = Kq$ . The K in this equation is a constant and is particular to a given location on the lake surface. A fourth lesson is that q is more variable over the lake surface than is K. Therefore, a practical method for estimating the emission of dust Fa was to measure q at many places and estimate K's as averages for the large active areas of the lake.

Our model of dust emissions for Owens Lake required high quality measurements of PM10 at several locations near the shoreline of Owens Lake and use of a transport model for emitted dust from the lake surface. We estimated K (equal to  $Fa/q$ ) for the most active areas of dust emissions at Owens Lake as follows: (1) Sand fluxes (q) were measured in a grid of 130 sand flux samplers. The grid has a separation distances of 1 km. (2) Concentration of PM10 were measured at several locations along the shoreline of Owens Lake. (3) Concentrations were modeled using CALPUFF. Initially, a "first guess" value for Fa/q was used with the 130 q values to give the Fa (vertical fluxes of PM10) for each square kilometer of Owens Lake. These Fa values were used in the model and the concentration field is calculated. (4) The ratios of the calculated concentrations at the locations of the TEOM instruments to the actual concentrations are found. Using the mean of these ratios the "first guess" Fa/q value is adjusted so that the predicted and measured concentrations agree one Fa/q value is found for each hour of a dust storm. (5) Owens Lake was divided into three areas having similar surface characteristics. Using appropriate data selection, one-hour Fa /q values that apply to the three distinct source areas of the lake were calculated.

## A71E-04 0915h INVITED

## Dust Aerosol Modeling: Step Toward Integrated Environmental Forecasting

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A number of models for real-time predicting of the atmospheric dust life cycle has been developed over recent years. Driven by atmospheric models, they are capable to predict dust process with generally reasonable accuracy. Components of an operational regional dust forecasting model will be presented in more details.

However, there are several aspects that limit dust models to further improve the quality of dust forecasts. Research areas that offer new dust modeling developments will be discussed. For example, significant improvements could be expected by model assimilation of lidar-based observations. Another promising application is improved treatment of dust-productive soil sources, (including their seasonal variability) by use of very high-resolution data on vegetation cover and soil features.

Being coupled on-line and with two-way dust-radiation feedback interactions with the atmospheric model drivers, future dust models will be capable to improve conventional weather forecasts as well. The approach of such model coupling will be elaborated, considering it as a component of future more complex integrated environmental modelling systems.

## A71E-05 0930h

## Forecasting Dust Storms Using the CARMA-Dust Model and MM5 Weather Data

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An operational model for the forecast of dust storms in Northern Africa, the Middle East and Southwest Asia has been developed for the United States Air Force Weather Agency (AFWA). The dust forecast model uses the 5th generation Penn State Mesoscale Meteorology Model (MM5), and a modified version of the Colorado Aerosol and Radiation Model for Atmospheres (CARMA).

AFWA conducted a 60 day evaluation of the dust model to look at the model's ability to forecast dust storms for short, medium and long range (72 hour) forecast periods. The study used satellite and ground observations of dust storms to verify the model's effectiveness. Each of the main mesoscale forecast theaters was broken down into smaller sub-regions for detailed analysis. The study found the forecast model was able to forecast dust storms in Saharan Africa and the Sahel region with an average Probability of Detection (POD) exceeding 68%, with a 16% False Alarm Rate (FAR). The Southwest Asian theater had average POD's of 61% with FAR's averaging 10%.

## A71E-06 0945h

## Near real-time verification of dust models: Possibilities and uncertainties for dust storm forecasting and analysis

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As aerosol transport models move from coarse global climate simulations to temporal and spatial scales of meteorology modeling and forecasting, there is an increasing need for real time verification of particle concentrations and optical depths. Clearly, improvement of dust forecasting is highly dependant on the proper joining of smaller-scale dust sources to the regional and sometimes continental dust clouds. This can in part be done through aerosol data analysis by both numerical and more subjective (forecaster) means. However, global aerosol data sets are few in number and are often inconsistent with one another. Real time aerosol data of the nature required to be utilized in an aerosol model or by a forecaster is very limited. While all data has some benefit when utilized properly it is unclear how the current set of rapidly produced aerosol products can be objectively included in dust forecast methods. In this paper we give an overview of available data and diagnose uncertainties for forecasters using the Navy Aerosol Analysis and Prediction System (NAAPS). We discuss the application and

uncertainties applying satellite data such as that from TOMS, SeaWiFS, GOES, MSG, and MTSAT. We also examine less traditional data sets such as near real time data from AERONET Sun photometers and surface/shipboard visibility measurements.

## A71F MCC: 102 Sunday 0830h

## Chemistry and Microphysics of Aerosol Particles I

Presiding: P Hamill, San Jose State University; P DeMott, Colorado State University

## A71F-01 0830h INVITED

## Are Organic Aerosols Good Cloud Condensation Nuclei?

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The ability of a set of organic-containing aerosols to act as cloud condensation nuclei has been measured in the laboratory using a thermal-gradient diffusion chamber operated at a fixed supersaturation. We observe that particles composed of soluble organics, such as malonic acid and adipic acid, activate at dry particle diameters in agreement with Köhler theory predictions assuming the solutes are fully soluble and the droplet has the surface tension of water. Surprisingly, we also observe that sparingly soluble azelaic acid and cis-pinonic acid particles also activate, perhaps because they are being formed in a supersaturated, amorphous state or that their activation is aided by surface uptake of water. Mixed organic/ammonium sulfate particles have also been studied, and a range of behavior is observed. Soluble species such as malonic acid enhance activation through the vapour-pressure lowering effect whereas a thick coating of stearic acid on ammonium sulfate makes the particles totally inactive. Lastly, we have observed that pure oleic acid particles, which show no indication of activation when pure, can be activated after exposure to gas-phase ozone. The atmospheric implications of our results will be discussed. An interesting issue is the degree to which we can quantitatively model our results by assuming the surface tension of the growing droplet is that of water, i.e. without the need to invoke the surface-tension-lowering effect due to surface-active organics.

## A71F-02 0850h INVITED

## Uptake of Water by Organic Films: the Influence of Degree of Oxidation on CCN Ability

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In order to understand the climatic significance of the presence of large mass fractions of organic compounds in atmospheric particles, the influence of organic constituents on the cloud nucleating abilities of atmospheric aerosol must be established. We have used a quartz crystal microbalance to study the uptake of water onto a series of organic films of differing hydrophobicity as a function of relative humidity. Room temperature results of the uptake onto dodecane, mono- and di-acids and mono- and di-alcohols will be presented. Gas-condensed phase modelling using UNIFAC predicts the uptake curves for some partially oxidized substrates (1-octanol, octanoic acid, 1,5 dipentanol) moderately well, but has much lower accuracy for dodecane, malonic acid or 1,8 diocetanol. Quantitative comparisons of the model with measurements will be presented, and the causes for the differences in accuracy will be discussed.

A71F-03 0905h

### The Importance of Organic Aerosol Components for the Surface Reactivity of Atmospheric Particles

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Secondary tropospheric particles are often mixtures of aqueous electrolytes and soluble organic components or surfactants. The uptake kinetics of e.g. N<sub>2</sub>O<sub>5</sub> and the thermodynamics of binary and higher mixtures of aqueous electrolytes are relatively well understood. In contrast not much is known on a quantitative basis about the modification of these properties by organic aerosol components.

The hydrolysis of N<sub>2</sub>O<sub>5</sub> on aqueous aerosol surfaces of mixed inorganic and organic aerosols was used to probe the surface reactivity/water availability. The experiments were performed in the large Aerosol Chamber at the FZ-Juelich.

The ozonolysis products of e.g.  $\alpha$ -pinene were utilized to coat NH<sub>4</sub>H<sub>2</sub>SO<sub>4</sub> particles. Reductions of the reaction probability  $\gamma_{N_2O_5}$  by a factor of 5 or 30 compared to the pure inorganic salt ( $\gamma_{N_2O_5} = 0.02$ ) were achieved, depending on the initial chamber load of  $\alpha$ -pinene. In analogous experiments but using outside Juelich air  $\gamma_{N_2O_5}$  is reduced by a factor of 3-7, depending on the actual hydrocarbon content. Model calculations indicate that for a reasonable range of parameters, the accommodation on the organic films or the phase transfer from the organic to the aqueous phase should be the rate determining step. The role of structure specific effects of individual substances (e.g. hydrogen bonding ability) will be discussed.

To study the effect of soluble components we used short chained dicarboxylic acids (C2- C6). On e.g. aqueous glutaric acid aerosol at 60% r.h.  $\gamma_{N_2O_5} = 0.01$  is a factor of two smaller compared to aqueous sulfates. Mixed particles sulfate/diacid are somewhere in between. In these mixed systems the heterogeneously formed nitric acid quickly replaces the diacids by nitrate. This is also true for NH<sub>4</sub>NO<sub>3</sub> / diacid systems.

The studies are part of the EC CASOMIO project.

A71F-04 0920h

### Mapping Carbon in Individual Particles From a Continental Aerosol

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Knowing the distribution of carbon in distinct aerosol particle types is important for assessing the atmospheric effects of both organic and elemental carbon. We collected aerosol samples at a rural background site in Hungary in all four seasons and under various meteorological conditions. Typically, at this site sulfates and organic species are equally important constituents, and in the summer about half of the organic carbon is water-soluble. The combination of transmission electron microscope imaging with energy-dispersive X-ray spectrometry, electron energy-loss spectroscopy, and energy-filtered elemental mapping allowed the identification of carbon in individual particles at high spatial resolution.

All major individual particle types contained carbon. (1) Sulfate particles were invariably coated by an organic film. The coating was 2 to 3 times thicker during pollution episodes than under clean conditions. (2) Soot occurred both externally and internally mixed with sulfates. (3) "Tar balls" contained mostly carbon, they were amorphous, had spherical morphologies and were not aggregated with other species. (4) "Summer sulfates" completely filled the holes of the collecting substrate. This behavior distinguished them from the sulfate particles under (1). Based on variations in the relative concentrations of main particle types under clean and polluted conditions, tar balls seemed to originate from anthropogenic sources, probably wood combustion. The organic coatings on the sulfates could also form from combustion emissions, particularly in the winter samples; however, the different character of the summer and winter sulfates likely indicates that natural organic materials condensed onto sulfates and contributed to the material that formed the coatings on "summer sulfates." Presumably at least some of the water-soluble fraction of the organic carbon resided in the coatings on ammonium sulfate particles.

A71F-05 0935h

### Thermodynamics Of Common Atmospheric Particles On The Nanoscale

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A significant fraction of atmospheric particles are hygroscopic by nature and exhibit the properties of deliquescence and efflorescence. Recent field studies have observed large nucleation events of hygroscopic particles and note discrepancies between predicted and observed particle growth rates after nucleation. These growth rates are governed, in part, by the thermodynamic properties of particles only a few nanometers in diameter. However, little thermodynamic information is currently available for nanometer-sized particles. The Kelvin relation indicates that the surface tension of a particle less than 100nm in diameter can dramatically affect the thermodynamics, and surface states may begin to influence the bulk physical properties in these small particles with high surface to volume ratios.

In this context, we are investigating the thermodynamic properties, including pre-deliqescence water adsorption, deliquescence, efflorescence, and supersaturated particle compositions of nanoparticles with mobility diameters in the range of 5 to 50 nm. We have developed a temperature and humidity-controlled laboratory-based Nano Differential Mobility Analyzer (NDMA) system to characterize the hygroscopic properties of the common atmospheric salt particles as a function of size. Two different aerosol generation systems have been used to cover the full size range. The first system (less than 20nm diameter) relies on an Atomizer (TSI 3076) to produce particles which are size-selected using an initial DMA. For particle sizes smaller than 20 nm, the ElectroSpray Aerosol Generator (EAG, TSI 3480) has been employed as a particle source. The EAG characteristically provides narrow size distributions, comparable to the monodisperse size distribution from a DMA, but with higher number concentrations. Once generated, the monodisperse aerosol flow is then conditioned with respect to humidity at a constant temperature and subsequently analyzed using a TSI Ultrafine CPC (Model 3010) modified for Pulse-Height Analysis. The dry particle sizes are also continually monitored by an external SMPS system (TSI 3936) to rectify errors in the calculated growth factor resulting from any drift in the dry particle size. The size changes of the humidified particles are directly correlated with the relative humidity and temperature. Our results of ammonium sulfate particles from 5 - 50 nm in diameter are consistent with those predicted from the Kelvin relation. The particle size affects both deliquescence and efflorescence of the homogeneous salt particles: the deliquescence relative humidity increases and the efflorescence decreases as particles become smaller. In addition, although the smaller the particle size the more significant water adsorption, the sharp deliquescence phase transition was obvious regardless of the particle sizes. The implications with respect to these observations will be further discussed at the presentation.

A71F-06 0950h

### Aerosol Particles From Tropical Cirrus Clouds in the Lower Stratosphere

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Aerosol samples were collected from convective systems and cirrus layers over Florida during the July 2002 CRYSTAL-FACE Mission. Particles between 0.02 and 700  $\mu$ m were deposited directly onto TEM grids. Here we report preliminary results of the TEM study of particles collected near and above the tropopause.

Most particles are sulfate droplets that range from 0.8 to 5  $\mu$ m in diameter on the TEM grids. All have a characteristic appearance that consists of a main central particle (0.3 - 1  $\mu$ m) surrounded by many smaller satellite droplets. Their appearance suggests that the droplets were sulfuric acid partially neutralized with ammonium at the time of collection, with ammonium sulfate and bisulfate constituting the central particles (Bigg, 1975, 1980). The degree of ammoniation in individual particles relative to satellite ring diameter, is fairly uniform. The ratio of central particle diameter to satellite ring diameter is generally around 0.3. Such ammoniated droplets with solid cores may be more efficient in nucleating cirrus than pure sulfuric acid droplets (Tabazadeh and Toon, 1998). Ammonium sulfate particles without satellites commonly coexist with the acid droplets.

Minor particles consist of C-rich amorphous material, silicates, Na- and K-chlorides and sulfates, and Cr- and Ti-oxides. Some were coated with sulfate. Many of the C-rich particles contain significant amount of K, S, and O with lesser N. All silicate particles are flakes of clay minerals that have pseudohexagonal structures. They would work as effective ice nuclei (Pruppacher and Klett, 1997).

A71F-07 1025h INVITED

### Single Particle Characterization of Atmospheric Ice Nucleating Aerosol

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A method to determine the chemical composition of single aerosol particles capable of nucleating ice has been developed. The Colorado State University Continuous Flow Diffusion Chamber (CFDC) was used to expose sub-micron ambient aerosol to conditions supersaturated with respect to both ice and liquid water. Particles which nucleated ice and grew to super-micron size were separated from those which did not activate using a Laboratory Counter-flow Virtual Impactor (LCVI). Condensed-phase water was removed and particle composition was ascertained using the National Oceanic and Atmospheric Administration Particle Analysis by Laser Mass Spectrometry (PALMS) instrument.

The viability of the CFDC/LCVI/PALMS method to activate a fraction of the ambient aerosol population, separate ice crystals from the remainder, and analyze their chemical composition was determined by laboratory experimentation. Specifically, a dual population of AgI (capable of nucleating ice under the experimental conditions) and NH<sub>4</sub>NO<sub>3</sub> (incapable of activation) particles was sent through the system. Results showed that only AgI particles were capable of passing through the LCVI and on to PALMS.

Subsequently the CFDC/LCVI/PALMS system was deployed at 3220 m elevation in north-central Colorado. The Desert Research Institute Storm Peak Laboratory was chosen for two primary reasons. First, a suite of gas phase and aerosol characterization instruments that include differential mobility analyzers and optical particle counters to obtain aerosol size distributions up to particle diameters of several microns are continuously run on-site. Second, the elevation of the lab is such that it sits in free tropospheric air during extended periods, often during the nighttime hours.

Several hundred mass spectra of aerosol particles which nucleated ice were collected during a three week period in November, 2001. Results indicate that the dominant background aerosol composed of sulfates did not act as ice nuclei. A subset, enriched in silicon and many of possible anthropogenic origin, was observed to induce ice formation. These same particles therefore make likely candidates for the formation of cirrus clouds.

URL: <http://www.al.noaa.gov/PALMS/>

A71F-08 1045h

### Solubility and Freezing Effects of $\text{Fe}^{2+}$ and $\text{Mg}^{2+}$ in $\text{H}_2\text{SO}_4$ Solutions at Upper Tropospheric and Lower Stratospheric Temperatures and Compositions

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Chemical elements characteristic of earth minerals and meteorites are present within background tropospheric and stratospheric sulfate aerosol particles. However, it is unknown (a) if these elements are present predominantly in a solid matrix, or rather as soluble aqueous metal ions or complexes and (b) how these impurities could affect particle freezing. To address these questions, we have determined the total equilibrium metal solubility (viz.  $[\text{Fe}^{2+}]_T$  and  $[\text{Mg}^{2+}]_T$ ) of  $\text{MgSO}_4$ ,  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ , and a mixture of metal sulfates representative of meteorite samples in 20 - 90 wt % sulfuric acid solutions over the temperature range 200 - 300 K. We estimate that soluble  $\text{Fe}^{2+}$  and  $\text{Mg}^{2+}$  respectively comprise ca. 0.02 - 0.3 wt % of the solutions at temperatures and acid compositions representative of the atmosphere. Bulk freezing experiments were also carried out on sulfuric acid containing soluble metal. It was found that 57.6 wt %  $\text{H}_2\text{SO}_4$  containing soluble meteoritic metal and 60 wt %  $\text{H}_2\text{SO}_4$  containing soluble Fe and soluble meteoritic metal froze approximately 12 - 20 K higher than solutions containing no soluble metal.

A71F-09 1100h

### The Effect Of Size Dependent Surface Adsorption On Crystal Nucleation In Binary Droplets

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We have recently considered the thermodynamics of crystallization in atmospheric droplets and have derived a criterion to determine when crystal nucleation at the droplet surface is thermodynamically favored over the volume process. For both unary and multi-component droplets, this criterion has the form of an inequality identical to the condition of partial wetting of at least one crystal facet by its melt. In the present work, we study the effect of adsorption of soluble surfactants on surface-stimulated crystal nucleation in binary droplets, and the dependence of this effect on the droplet size. Soluble surfactants in aqueous droplets are mainly composed of molecular species such as nitric acid and/or organic molecules. A droplet is modeled to consist of an internal part of more or less uniform density and a surface layer. Assuming the droplet to be in equilibrium with the surrounding vapor mixture, we derive a set of equations to determine the main physical characteristics of both the interior and surface layer of the droplet. We outline a procedure to evaluate the parameters in an adsorption isotherm that needs to be known for the application of our theory. Performing numerical evaluations for the case of aqueous nitric acid droplets, we show that an increase in the overall surfactant concentration in the interior of the droplet causes an increase in the surfactant concentration (in this case molecular nitric acid) at the surface layer. Although this leads to a decrease in the droplet surface tension, the condition of partial wetting may still hold due to an increase in the overall solid-liquid surface tension of the crystalline nucleus. Thus, surface-stimulated crystallization may remain an important mechanism for the freezing of atmospheric droplets even at high concentrations of soluble surfactants. Finally, the impeding effect of soluble surfactants on surface crystallization in multicomponent droplets becomes weaker with decreasing droplet size due to an increase in the surface-to-volume ratio.

A71F-10 1115h

### Atmospheric Ion Clusters: Properties and Size Distributions

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Ions are continuously generated in the atmosphere by the action of galactic cosmic radiation. Measured charge concentrations are of the order of  $10^3 \text{ cm}^{-3}$  throughout the troposphere, increasing to about  $5 \times 10^3 \text{ cm}^{-3}$  in the lower stratosphere [Cole and Pierce, 1965; Paltridge, 1965, 1966]. The lifetimes of these ions are sufficient to allow substantial clustering with common trace constituents in air, including water, nitric and sulfuric acids, ammonia, and a variety of organic compounds [e.g., D'Auria and Turco, 2001 and references cited therein]. The populations of the resulting charged molecular clusters represent a pre-nucleation phase of particle formation, and in this regard comprise a key segment of the over-all nucleation size spectrum [e.g., Castleman and Tang, 1972]. It has been suggested that these clusters may catalyze certain heterogeneous reactions, and given their characteristic crystal-like structures may act as freezing nuclei for supercooled droplets. To investigate these possibilities, basic information on cluster thermodynamic properties and chemical kinetics is needed. Here, we present new results for several relevant atmospheric ion cluster families. In particular, predictions based on quantum mechanical simulations of cluster structure, and related thermodynamic parameters, are compared against laboratory data. We also describe a hybrid approach for modeling cluster sequences that combines laboratory measurements and quantum predictions with the classical liquid droplet (Thomson) model to treat a wider range of cluster sizes. Calculations of cluster mass distributions based on this hybrid model are illustrated, and the advantages and limitations of such an analysis are summarized.

#### References:

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### Surface Nucleation as a Mechanism for the Formation of Solid Polar Stratospheric Cloud Particles

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Polar stratospheric clouds (PSCs) are observed in the Arctic and Antarctic winter stratospheres when temperatures dip below 200 K. The first manifestation of these clouds is the formation of ternary system ( $\text{HNO}_3/\text{H}_2\text{O}/\text{H}_2\text{SO}_4$ ) droplets by the absorption of water and nitric acid into pre-existing sulfuric acid solution droplets. The ternary system droplets are numerous, small and liquid. As the temperature drops further, at some stage, a small fraction of these ternary system droplets freeze, forming relatively large solid particles that are primarily either nitric acid dihydrate (NAD) or nitric acid trihydrate (NAT). The formation process is not well understood. Homogeneous nucleation of the solid phase from the liquid does not yield rates in agreement with observations if one assumes hydrate germs form within the bulk volume. We show that assuming a nucleation rate proportional to surface area brings various laboratory measurements of the nucleation rate of the solid phase into much better agreement than assuming the rate is proportional to the volume. We describe the thermodynamic conditions under which surface crystallization is favored over volume (bulk) crystallization. Finally, we show that atmospheric ions could serve as germs for the crystallization of ternary system droplets.

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### Measurements of Heterogeneous and Homogeneous Ice Nucleation by Atmospheric Aerosols

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Measurements during two recent field campaigns have provided the first direct evidence on the role of heterogeneous and homogeneous ice formation mechanisms in the formation of cirrus clouds. Natural aerosols were processed at controlled temperature and relative humidity conditions in a continuous flow ice-thermal diffusion chamber. Conditions required for the onset of homogeneous freezing nucleation were noted and compared to expectations based on laboratory and theoretical studies for sulfates and sulfate-organic aerosol mixtures. Heterogeneous nucleation was investigated at temperatures warmer than the homogeneous freezing nucleation temperature of pure water and at relative humidities that were too low to support the degree of haze particle dilution required for homogeneous freezing at colder temperatures.

Free tropospheric aerosols were sampled from a mountaintop (3220 m MSL) site in the Ice Nuclei SPECTROscopy program, which also focused on determining the chemical composition of processed ice nuclei by mass spectroscopy and transmission electron microscopy [see Cziczo, this conference]. In this study, 1) a methodology for differentiating conditions necessary for heterogeneous versus homogeneous freezing nucleation was validated, 2) heterogeneous nuclei were detected in concentrations ranging from 1 to 50 per liter at conditions relevant to the upper troposphere, 3) the most abundant composition of heterogeneous nuclei were mineral dust-like particles, and 4) conditions required for activating homogeneous freezing of solution droplets were found to be in agreement with laboratory studies of sulfate aerosol freezing, including inferences to the sometimes deleterious effects of associated organic constituents. Similar measurements were obtained from an aircraft platform during the NASA CRYSYAL-FACE experiment, when sampling both ambient air and residual particles from cirrus ice crystals. Heterogeneous ice nuclei were present in similar concentrations in the upper troposphere in this study, but large enhancements of heterogeneous nuclei were found in inferred dust layers.

A71G MCC: 123 Sunday 0830h

### Tracer Transport Using Assimilated Meteorological Data Sets: Successes and Failures I

Presiding: S Pawson, NASA Goddard Space Flight Center; M Schoeberl, NASA Goddard Space Flight Center

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### Evaluating assimilated wind transport of mineral aerosols

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Mineral aerosols are hypothesized to impact climate by influencing the radiative budget and ocean and terrestrial biogeochemistry. Sources of mineral aerosols are dry, unvegetated soils with easily erodible soils and