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Potassium alum and aluminum sulfate micro-inclusions in polar ice from Dome Fuji, East Antarctica

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Water-soluble trace constituents affect the physicochemical properties of polar ice. Their structural distribution provides important insights into the formation history of ice and inclusions. We report the first finding of KAl(SO4)2·12H2O (potassium alum) and Al2(SO4)3·*n*H2O (aluminum sulfate) micro-inclusions in the Dome Fuji ice core, East Antartica, using a micro-Raman technique. Eutectic temperatures of these water-soluble species determined using thermal analysis were −0.4° C for potassium alum and −8.0° C for aluminum sulfate. Although the formation process of the aluminum-bearing sulfates remains unclear, the occurrence of these salts largely depends on ice depth.

Comparison of tide model outputs for the northern region of the Antarctic Peninsula using satellite altimeters and tide gauge data

Fernando A. Oreiro, Enrique D'Onofrio, Walter Grismeyer, Mónica Fiore, Martín Saraceno

This study compares the common harmonic constants of the O1, K1, P1, Q1, M2, S2, N2, and K2 tidal constituents from eight global and four regional tide models with harmonic constants from satellite altimeter and tide gauge data for the northern region of the Antarctic Peninsula (58° S–66° S, 53° W–66° W). To obtain a more representative comparison, the study area was divided into three zones with different physical characteristics but similar maximum tidal amplitude variations: Zone I (north of 62° S), Zone II (south of 62° S and west of the Antarctic Peninsula), and Zone III (between 62° S and 64.3° S, and east of 58.5° W). Root sum square (RSS) values are less than or equal to 3.0, 4.2, and 8.4 cm for zones I, II, and III, respectively. No single model shows superior performance in all zones. Because there are insufficient satellite altimetry observations in the vicinity of Matienzo Base (64.9761° S, 60.0683° W), this station was analyzed separately and presents the greatest values of both root mean square misfit and RSS. The maximum, minimum, and average amplitude values of the constituents that follow in

importance after the eight common tidal constituents, and which have amplitudes greater than 1 cm, are also analyzed.

An observational study of radiation temperature inversions in Fairbanks, Alaska

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A series of high resolution radiosonde launches were conducted over seven case-study days spanning spring 2009 and fall/winter 2010 during clear and calm nights at Fairbanks, Alaska to evaluate the effects of solar radiation, snow covered surfaces and low-level winds on the formation and evolution of surface-based temperature inversions (SBI). Transition seasons were selected because strong nighttime radiation cooling allows well-defined inversions to form while sufficient daytime solar heating allows the observation of dissipation processes in the sub-arctic latitudes. During the fall/winter period, co-located Doppler phased array acoustic soundings (SODAR) were carried out. The height of the SBI retrieved by radiosonde and SODAR did not differ more than 50 m. However, the SODAR profiles display a much more complex structure in the atmospheric boundary layer. Observations during this experiment demonstrated that the formation of the SBI is initiated by a rapid cooling at the surface followed by a steady columnar cooling and subsequent growth of the SBI depth overnight.

Isolation, identification and characterization of highly tellurite-resistant, tellurite-reducing bacteria from Antarctica

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The tellurium oxyanion, tellurite, is extremely noxious to most living organisms. Its toxicity has been mainly related to the generation of reactive oxygen species (ROS) as well as to an unbalancing of the thiol:redox buffering system. Nevertheless, a few bacteria are capable of thriving at high tellurite concentrations. One mechanism of resistance is the enzymatic and non-enzymatic reduction of tellurite to the less toxic elemental tellurium. This reduction generates nano- to micrometric tellurium crystals that display different shapes and sizes.

To date, a very limited number of highly tellurite-resistant and tellurite-reducing bacterial species are available from international culture collections. In this work, we decided to look for tellurite-reducing bacteria from an extreme environment, Antarctica. This environment exhibits a combination of several extreme factors such as high UV-radiation and desiccation and freezing conditions that impact directly on the local biodiversity. Since, as does, all these factors induce ROS formation, we hypothesized that Antarctic bacteria could also exhibit tellurite-resistance. In this context, we isolated 123 tellurite-resistant bacteria, and characterized six new tellurite-resistant and tellurite-reducing bacterial strains from samples collected in Antarctica. These strains were identified according to their 16S rRNA gene

sequence as Staphylococcus hameolyticus, Staphylococcus sciuri, Acinetobacter haemolyticus, Pseudomonas lini, and two strains of Psychrobacter immobilis.

The isolates display tellurite-resistance about 35- to 500-fold higher than *Escherichia coli* (Te-sensitive organism), and a high level of tellurite reduction which might be interesting for an application in the field of bioremediation or nanoparticle biosynthesis.