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Contribution of Feldspar and Marine Organic aerosols to global ice nucleating particles concentrations

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Ice nucleating particles (INP) are aerosol particles that can heterogeneously freeze supercooled liquid water in the mixed-phase range of temperatures where water can exist in both liquid and ice states (0 to -37 oC). They affect the amount of ice and liquid water in mixed-phase clouds changing many of their properties. Climate models tend to represent their effect by parameterizing their atmospheric concentration as function of temperature or temperature and aerosol loading. However, different aerosol species nucleate ice with different abilities affecting the concentrations in different parts of the world. Representing these differences in models can lead to a better representation of mixed-phase clouds and ice processes affecting the radiative flux and the climate sensitivity of climate models. Here, we present the simulated concentrations of K-feldspar and marine organic aerosols using a global aerosol model, and then estimate the contribution of these species to INP concentrations across the globe using laboratory developed parameterizations of their ice nucleating ability. We show that these two species combined perform better at predicting global observations of INP than typically used parameterizations. Biases appear mainly in terrestrial environments at high temperatures, which might be caused by a relevant missing source of INP in our model. This work is a step forward in our understanding of how INP are distributed and what species are needed to be included in models in order to improve the representation of heterogeneous ice nucleation.