DIRECT AND INVERSE PROBLEM FOR GAS DIFFUSION IN POLAR FIRN

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Simultaneous use of partial differential equations in conjunction with data analysis has proven to be an efficient way to obtain the main parameters of various phenomena in different areas, particularly in the study of climate change (including global warming) over the past centuries. This requires estimating different gas concentrations in the atmosphere, mainly CO2. In this context, Antarctic and Greenland Polar snow and ice constitute a unique archive of past climates and atmospheres.

The mathematical model of gas trapping in deep polar ice (FIRN) has been derived in [1], consisting of a parabolic partial differential equation that is almost degenerate at one boundary extreme. In this talk, we present the theoretical aspects of existence, uniqueness and simulation for such direct problem ([2]) and consequently formulate the inverse problem that attempts at recovering the diffusion coefficients using given generated data ([3]).

References

[1] E. , P. Martinerie, C. Hogan, et al. (2012). *A new multi-gas constrained model of trace gas non-homogeneous transport in Firn*, Atmos. Chem. Phys., 12, 11465–11483.

[2] S. Moufawad, N. Nassif, and F. Triki, *Direct Problem of Gas Diffusion in Polar Firn*, Arxiv preprint arxiv:2207.07352, 2022.

[3] S. Maad. *Identification of Gas Diffusion Coefficients in Polar Firn*. 2022. American University of Beirut, Master thesis.