

New constraint on Europa's ice shell: Magnetic signature from the ocean

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Jupiter's icy moons are believed to host subsurface liquid oceans, and among them, Europa stands out as one of the most promising candidates for extraterrestrial life. Yet, the processes driving oceanic flows beneath its ice shell, as well as the factors controlling the thickness of this ice, remain incompletely understood. One especially distinctive feature of Europa is that its salty ocean is electrically conducting and thus influenced by Jupiter's time-varying magnetic field, which is believed to drive a large-scale zonal flow. In this presentation, I will examine how this magnetically induced jet affects both the heat flux and the dynamics of the convective flow within Europa's ocean. I'll first discuss how the magnetically-driven jet efficiently transports heat in stably stratified regions near the top of the ocean, and may alter the expected convective scaling laws in deeper layers. Second, by analysing the latitudinal distribution of heat flux and relating it to ice-thickness variations, I'll present some predictions that can be compared with current observations. In anticipation of the upcoming JUICE and Europa Clipper missions, improved measurement precision could help further constrain the ocean's properties and refine our model-based forecasts.

Joint work with Christophe Gissinger and Ludovic Petitdemange