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# The Size of the Solid Inner Core and Magnetic Field Configuration at the Dynamo surface

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In a recent study (Cao et al., 2012) based on in-situ magnetic field measurements made by the Cassini spacecraft, several distinct features of Saturn's magnetic field have been revealed. The field at the dynamo surface is found to be strongly concentrated near the spin-poles with little hemispherical asymmetry. This field geometry corresponds to a zig-zag shape magnetic spectrum with pronounced odd degree terms and all odd degree magnetic moments possess the same sign. This is in contrast to the field properties at the core surface of the Earth and in convection-driven geodynamo simulations, where the field near the spin-poles is at a relative minimum compared to field at mid-latitude.

In this study, we propose that the absence of a solid inner core inside the planet could be responsible for the poleward flux concentration at the dynamo surface. The simple physical picture underlying this hypothesis is the concentration of convection columns near the spin axis after the solid inner core as an obstacle is removed. We test this hypothesis using numerical dynamo simulations. The heat source in our model is the uniform secular cooling of the planet. Different heat flux patterns at the outer boundary are also applied.

In the end, we explore the possible field geometries at the dynamo surface of Jupiter, Uranus and Neptune consistent with the available in-situ observations at each planet. Properties including the Lowes spectrum, field symmetry are analyzed.