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Planet/lab double small diffusion magnetism/convection

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Planetary convection and magnetic instabilities driven by thermal or/and compositional power are investigated in their natural limit of small transport or diffusion coefficients. Correspondent laboratory model for convection onset is suggested and theoretically explored up to the asymptotic values suitable for the planets and large moons with convection in their deep interiors.

For the Earth's type planets/moons the strong influence of the inner rigid core size is found on such double diffusion convection/magnetism onset and support. The relative size about half of the modern Earth's inner core size makes compositional convection valuable and able on addition magnetic support as in the past Earth or on magnetic appearance possible in future Venus. Then the core growing supports thermal convection (and related magnetism, e.g. in Ganymede, if any) up to the about half of the convective shell size. Further growing of the inner core suppresses the compositional convection which died out when thickness of the shell become too small as it is possibly was in the past Mars when its magnetic dynamo has been stopped.

Thermal convection alone seems enough to support magnetic fields in the outer planets, while it is interesting to note that the principal energy-force MAC balance of Braginsky is about the same in the Earth's, Jupiter and Saturn. Uranus, Neptune and perhaps Ganymede magneto-convection should be in another not yet explored new balance that is between buoyancy, super-adiabatic entropy, inertia and magnetism.

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