Geophysical Research Abstracts, Vol. 9, 06329, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-06329

The Formation of Jupiter and Saturn

A.Coradini (1) and G.Magni (2)

(1) Istituto dello Spazio Interplanetario, INAF, Roma , Italy, (2) Istituto di Fisica Spaziale, Inaf, Roma, Italy ,(Angioletta.coradini@ifsi-roma.inaf.it)

In this presentation we will review the Jupiter and Saturn formation process. The formation of Jupiter and Saturn is of increasing interest, not only for themselves, but to understand the differences and the similarities between our solar system and what had been observed of extrasolar planets. Because Jupiter and Saturn are mostly gaseous and probably accreted a large part of their masses from the Solar Nebula (SN) when the gas was still abundant., their existence sets interesting constraints on the properties of the SN and the boundary conditions for terrestrial planet formation. Our model is based on the assumption that the Jupiter and Saturn cores are formed first, and that the gas of the nebula is accreted onto it. Present refinement of modelling of Jupiter interior seem to indicate that it rocky core is quite small, while Saturn one still contains few earth masses. However, it is not clear what is the dissolution rate of the core in the metallic hydrogen surrounding it. Therefore our model still assumes the presence of a solid core onto which the nebular gas is accreted. A 3D mesh simulates the rotating Keplerian feeding zone, with the structure of the grid constructed to take into account the two main gravitational attractors (Sun and protoplanet). The gas accretion is studied in 3D scheme, without making any special assumption on spherical symmetry. The thermal structure of the feeding zone and, in particular of the region surrounding the growing planet, is computed taking into account adiabatic and radiative exchanges among the different cells in which the fluid is divided, by solving the time-dependent radiative equations (computed with ADI method). The structure of the protoplanet is computed taking into account radiative and convective transport, and the luminosity is produced by the energy released in infalling gas and planetesimals, under the approximation of homologous variation of the structure.