## Joint 20th AIRAPT - 43th EHPRG, June 27 - July 1, Karlsruhe/Germany 2005

## The high-pressure phase diagram of the NH<sub>3</sub>- H<sub>2</sub>O system

<u>Grasset O</u>., Pargamin J., Choukroun M. UMR 6112, NANTES /FRANCE, Olivier.Grasset@chimie.univ-nantes.fr

The ammonia- water system has been extensively studied by petrologists in the past decades below 0.2 GPa mainly because ammonia is a good inhibitor of clathrate formation. This system is now explored at larger pressures by planetologists because large amount of ammonia are supposed to be trapped in ices in the outer solar system and in geant ocean-exoplanets. In order to respond to this new interest, an accurate description of the ammonia effect on both the melting temperature and stability of high pressure ices is proposed.

The water rich region of the ammonia - water phase diagram presents at least six solid phases. The three characteristics of the diagram are: i) the melting temperature of ices decreases strongly when ammonia is added; ii) there is a peritectic curve corresponding to the reaction L+lce  $\Leftrightarrow$  Dihydrate; iii) the eutectic

curve (L⇔Dihydrate+Monohydrate) is located at very low temperature (180 K). Previous data are mainly located in the [0-300] MPa pressure range and in the waterrich domain (Fig. 1). Thus, except for ice I, ammonia effects on the melting temperature of HP ice polymorphs is not well known.



New experiments have been carried out in an optical sapphire anvil cell coupled to a Raman spectrometer for adding data at high pressures. Based on previous and new data, a thermodynamical description of the different liquidii of the ammoniawater system will be proposed. It will be shown that the low pressure and water rich domain of the system is well constrained. Furthermore, the stability field of both high pressure ices and ammonia hydrates can be roughly defined. Implications of these results for studying internal structures of large icy satellites of Jupiter and Saturn and large planets of outer stellar systems will be shortly described.