Structure analysis of hydrogen-ordered ice in the Universe using infrared spectroscopy and neutron diffraction measurements

Masashi Arakawa[1]; Hiroyuki Kagi[1]; Hiroshi Fukazawa[2]

[1] Geochem. Lab., Grad. School Sci. Univ. Tokyo; [2] JAEA

http://www.eqchem.s.u-tokyo.ac.jp/˜arakawa/

Existence of ferroelectric ice in the Universe was suggested from a neutron diffraction and neutron scattering study. The ferroelectric ice XI is a stable low-temperature phase of ice Ih. Hydrogen atoms in Ice XI are structurally ordered.

Ice XI is stable at a narrow temperature range 57-66 K. In our solar system, Uranus and its satellites are within this temperature range. Surface temperatures of Neptune, Pluto and their satellites are lower than the range, but the subsurface of these objects is in the temperature range. In near future, these objects will be spectroscopically observed by radio telescope and interplanetary exploration. To obtain the direct evidence for ice XI in the Universe, we try to measure infrared spectra of ice XI at atmospheric pressure.