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Neutron scattering methods for studies in geoscience

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The Institut Laue Langevin (ILL) operates a nuclear reactor, which is the finest steady-state source of neutrons in the world. By using different neutron scattering techniques as neutron diffraction or neutron spectroscopy, one is able to obtain information about the structure and the dynamics respectively, of a system at atomic level. In addition, neutron scattering techniques allow one to measure both coherent and incoherent processes and therefore to obtain information about the nature of motions in condensed matter that can range from single particle dynamics to collective motions. Since the neutron has a magnetic moment, neutron scattering is also an extremely powerful technique for studying magnetic properties in matter.

After a short description of the institute, its neutron source and the interaction nature between neutrons and matter, an introduction to different neutron scattering techniques will be presented. A comparison with experimental techniques that are complementary to neutron scattering will be given. Then, applications of neutron scattering to several studies in geoscience will be presented, in particular on the structure and dynamics of liquid metals.