Observation of magnetic fluctuation in Ni2(OD)3Cl by neutron scattering

Y. Oohara1, M. Hagihala2, X.G. Zheng2
1, ISSP, Univ. of Tokyo, 2, Faculty of Sci. and Engineer. Saga Univ.

As the temperature is decreased, conventional magnetic materials exhibit a slowing down of the magnetic fluctuations as the temperature approaches the critical point, Tc (namely the critical slowing down). Crossing Tc, the fluctuations disappear rapidly and the magnetic moments are frozen into static at T << Tc. All conventional magnetic materials of ferromagnets, antiferromagnets or spin glasses are featured by the freezing of magnetic moments into static. Recently there are reported new dynamical magnetic states of spin ice and spin liquid in rare earth pyrochlores where magnetic fluctuation persist down to 0 K. However, these states are basically disordered and do not have an order over a macroscopic range (long range order). It is believed that a long range order in magnet must be fully frozen (static).

However, recently we observed an exotic dynamical antiferromagnetic order below TN=4.5K in Ni2(OH)3Cl by muon spin relaxation (1). The present neutron scattering study was designed to further investigate this magnetic order. Elastic and inelastic measurements were performed at HQR and HER, respectively, at JAEA. The elastic measurement showed a clear long range order extending over a spacing of approximately 56 (Fig. 1). Inelastic measurements suggested spin fluctuation of 0.5 meV at 0.8 K, which is less than 1/5 of its transition temperature. The analysis to reveal its magnetic structure is in progress.

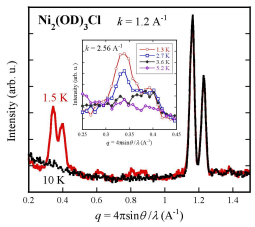

Fig. 1. Elastic scattering data showing magnetic reflections in the ordered state. The inset plot shows the evolution of two magnetic peaks below TN.

References:
[1] X. G. Zheng, M. Hagihala, K. Nishiyama, T. Kawae,Physica B 404 (2009) 677-679.