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Spin fluctuations in Na_xCoO_2 from neutron inelastic scattering

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The recent discovery of superconductivity in water-intercalated Na_xCoO_2 has been greeted with great excitement and has raised speculation about another possible route to high-T_c superconductivity. What is exciting is that both the magnetic transition metal (Co) and the geometry of the layers (triangular) are different from other transition-metal oxide superconductors (e.g. cuprates and ruthenates), so it is likely that a new mechanism of superconductivity is applicable. Given what we know about superconductivity in other unconventional oxide superconductors it is also probably that magnetic fluctuations play a role in the formation of superconductivity. I will report neutron scattering measurements of the magnetic dynamics for the non-superconducting precursor material Na_xCoO_2 ($x = 0.75$). The data reveal ferromagnetic correlations within the cobalt-layers and antiferromagnetic correlations perpendicular to the layers. Surprisingly, despite the two-dimensional structure of the material the magnetic correlations are found to be three-dimensional, with the inter- layer exhange about a factor two larger than the intra-layer exchange. I will discuss the results in relation to current theories of the electronic structure.