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Role of the magnetic field on the formation of solar type stars

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Abstract. Magnetic fields play a key role during the gravitational collapse of dense protostellar cores. In recent years mm and sub-mm observations of dust polarized emission have been used to unveil the morphology of the magnetic field, but this method relies on the assumption that non-spherical dust grains are well aligned with the magnetic field.

Using non-ideal MHD numerical simulations, we study the evolution of the magnetic field during the gravitational collapse. We use the state-of-the-art radiative transfer code POLARIS to compute the Stokes parameters and produce synthetic observations of mm/submm polarized dust emission. We compare the results obtained using the radiative torques (RAT) mechanism to the results obtained by assuming that grains are perfectly aligned to constrain how well polarized dust emission traces the magnetic field orientation.

The complexity of the magnetic field produces a mild depolarization. The depolarization observed in the inner regions is rather caused by a decrease of the dust alignment efficiency and it cannot be reproduced by just scaling down the polarisation degree obtained for a uniform efficiency. We find that the magnetic field orientation is well constrained by the polarized dust emission as long as its 3D topology remains organized.

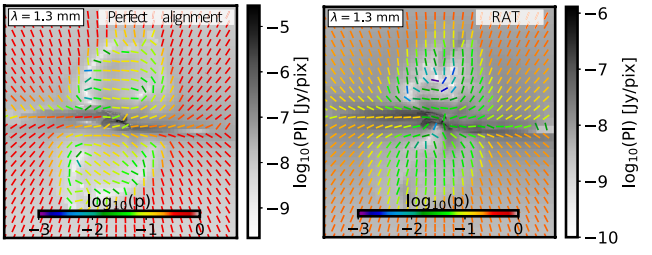

Figure 1. Total linearly polarized emission (background) and magnetic field orientation (vectors) for the perfect alignment case (*left*) and the RAT case (*right*). The color-scale of vectors shows the polarization fraction.

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