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MHD simulations in cosmology: from large galaxy clusters to dwarf galaxies.

The evolution of the magnetic field in the universe is believed to proceed through a first phase of field generation through microscopic processes (Biermann Battery) at early time (cosmic reionization) followed by a second phase of a magnetic (alphaomega) dynamo in galactic disks. During the last 10 years, cosmological simulations of structure formation including the evolution of the magnetic field have been performed. The goal is to understand the evolution of the magnetic field within the hierarchical picture of galaxy formation. The first attempts have focused on the generation of magnetic fields at the Epoch of Reionization, on one hand, and on the amplification of magnetic fields by merger-driven turbulence in galaxy clusters on the other hand. The evolution of magnetic fields in galaxies has been only recently investigated by several groups. I will discuss some of the numerical aspects of cosmological MHD, and present recent results obtained in MHD simulations of clusters and galaxies within a cosmological context.