# MHD Simulation of X-ray Coronal Jets Produced by Flux Emergence

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## Abstract

We carry out an MHD simulation of the emergence of a twisted magnetic flux rope from the solar interior into a tilted open coronal magnetic field to model the development of X-ray coronal jets. From the simulation data we compute the synthetic X-ray images for Hinode/XRT. We find that the observed transition of the "standard" to "blowout jet" morphology in X-ray emission can be reproduced by the simulation. The "standard jet" morphology is seen in the earlier phase when the emerged flux is still stably anchored, and magnetic reconnection between the outer emerged field and the open field produces the narrow jet, the bright dome, and the jet bright point on the side. The "blowout jet" morphology is produced when the emerged flux rope begins to erupt, and the twisted core field of the flux rope reconnects with the open field, leading to the widening of the jet and brightening of the jet base. We find that two rotating jet columns develop, with the same sense of rotation. The rotation is driven by the unwinding of the twisted magnetic field in the open jet columns. The ejection speed and the rotational speed in the jet columns are consistent with the observed values for blowout jets. The open jet field is found to be preferentially rooted in one leg of the emerged flux rope, while the closed bright point field is preferentially connected to the other leg. Our simulation results suggest that many aspects of the observed X-ray morphology seen in coronal jets can be reproduced by the emergence and eruption of a twisted flux rope into an ambient open coronal magnetic field.