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## **The formation of a magnetic channel by emergence of current-carrying magnetic field**

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**Abstract.** We carried out a detailed analysis on the formation of the magnetic channel in AR 10930. The term magnetic channel indicates a series of polarity reversals separating elongated flux threads with opposite polarities. We have observed the emergence of the flux thread which comprises the magnetic channel using data taken by Solar Optical Telescope (SOT)/Hinode, and found that: 1) the clear upflow (-0.5 to -1.0 km/s) and the downflow (+1.5 to +2.0 km/s) took place inside and at both tips of the thread respectively, 2) a pair of strong vertical currents with the opposite directions existed along the channel. The non-linear force-free field (NLFFF) model we obtained showed that: 3) highly sheared field lines continuously emerged along the channel and the coronal current density gradually increased as the field emerged. With these observational results, we suggest that the magnetic channel represents the emergence of the twisted flux tube that may have been formed below the surface before the emergence.