

Helicity and Magnetic Configuration of Solar Filaments

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Solar filaments are cold dense materials suspended in the hot tenuous corona. It is generally believed that they are supported by magnetic dips against gravity. Magnetic dips exist in two types of magnetic configurations, i. e., flux ropes and sheared arcades. In the 1980s and 1990s, these two types of magnetic configurations were confirmed with the magnetic field measurement. Considering that this kind of magnetic measurement is rare in the past twenty years, we propose an indirect method to infer the magnetic configuration of solar filaments based on the sign of helicity and the bearing sense of the filament barbs (or threads). After applying this new method to the solar filaments observed by SDO/AIA from 2010 to 2015, we found that 89% of the filaments belong to the inverse-polarity events, i. e., they are supported by flux ropes, whereas 11% of the events belong to the normal-polarity filaments, i. e., they are supported by sheared arcades. We also proposed a new method to infer the sign of helicity of the filament channels, and it is found that over 90% of the solar filaments show the hemispheric preference, i. e., the helicity is negative in the northern hemisphere and positive in the southern hemisphere.