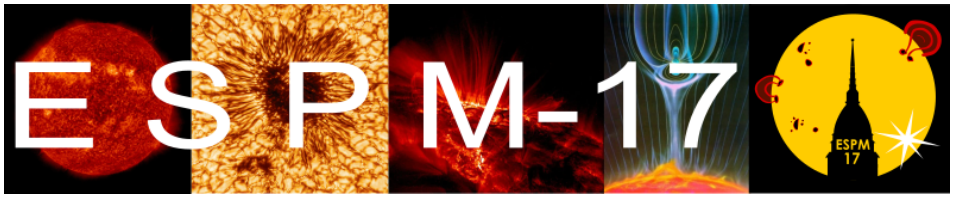


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# On the common appearance of superstrong magnetic fields in bipolar light bridges

Bipolar light bridges (BLBs) are bright features in sunspots located between two umbrae with opposite magnetic polarity. Recent observations revealed intriguing cases of BLBs with very strong magnetic fields of the order of 8.2 kG, which is at least twice the typical values measured in sunspot umbrae. Since these observations were only a few, it is a question of whether BLBs with extraordinarily strong fields are very rare. To investigate this, we aim to determine the field strength in a large sample of BLBs. For this, we used the most extensive set of spectropolarimetric observations of sunspots with BLBs compiled so far, consisting of data acquired with Hinode/SOT-SP. We analyzed these data using a state-of-the-art inversion technique, which accounts for the data degradation caused by the intrinsic point spread function of the telescope. We identified 98 individual BLBs within 51 distinct sunspot groups. Since 66% of the identified BLBs were observed multiple times, our sample contained a total of 630 spectropolarimetric scans. Our analysis showed that 89% of the (individual) BLBs contain magnetic fields stronger than 4.0 kG, at the height of maximum magnetic sensitivity with even higher field strengths in deeper layers. We also found that BLBs display a unique continuum intensity and field strength combination, forming a population well-separated from the umbrae and the penumbrae. The implications of our work influence our understanding of the magnetic structure of complex sunspot groups, which is one of the pillars of solar physics.

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