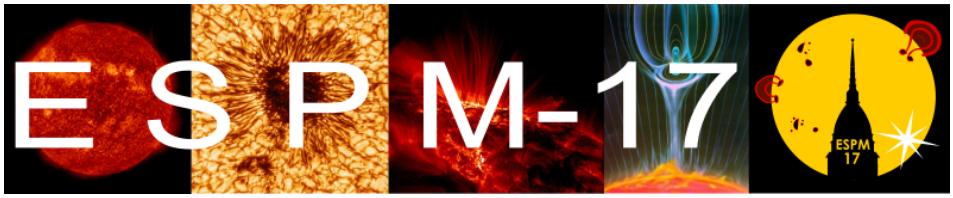

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Magnetic helicity and energy budgets of jet events from an emerging solar active region

Using photospheric vector magnetograms obtained by the Helioseismic and Magnetic Imager on board the Solar Dynamic Observatory (SDO) and a magnetic connectivity-based method, we compute the magnetic helicity and free magnetic energy budgets of a simple bipolar solar active region (AR) during its magnetic flux emergence phase which lasted ∼47 hrs. The AR did not produce any coronal mass ejections or flares with an X-ray class above C1.0 but it was the site of 60 jet events during flux emergence. The helicity and free energy budgets of the AR were below established eruption-related thresholds throughout the interval we studied. However, in addition to their slowly-varying evolution, each of the time profiles of the helicity and free energy budgets showed discrete localized peaks, eight of which occurring at times of jets emanating from the AR. These jets featured larger base areas than other jets triggered in the AR. We estimated, for the first time, the helicities and free magnetic energies associated with the jets; they vary in the ranges $(0.5-7.1)\times10^{40}$ Mx^2 and $(1.1-10.4)\times10^{29}$ erg, respectively. The pertinent percentage changes were significant and ranged from 13% to 76% for the normalized helicity and from 9% to 57% for the normalized free energy. Our study indicates that occasionally jets may play a significant role in the evolution and dynamics of emerging solar active regions by having a significant imprint in the evolution of their helicity and free magnetic energy budgets.

Primary author: NINDOS, Alexander (University of Ioannina, Greece)

Co-authors: Prof. PATSOURAKOS, Spiros (University of Ioannina, Greece); Dr MORAITIS, Kostas (University of Ioannina, Greece); Prof. ARCHONTIS, Vasilis (University of Ioannina, Greece); Dr LIOKATI, Evangelia (University of Ioannina, Greece); Dr GEORGOULIS, Manolis (The Johns Hopkins University Applied Physics Laboratory, USA and Research Center for Astronomy and Applied Mathematics, Academy of Athens, Greece); Dr NORTON, Aimee (Stanford University, USA)

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