



Contribution ID: 151

Type: **Invited review talk**

## Eruptive and Non-Eruptive Solar Active Regions: What Sets them Apart?

*Friday, January 24, 2025 8:30 AM (25 minutes)*

An overview of works on potential distinct behaviors between flaring / eruptive and flare-quiet / non-eruptive solar active regions will be attempted. Focus will be assigned to the most distinctive physical quantities that characterize active regions, namely magnetic energy and helicity budgets, as well as associated non-neutralized electric currents. Emphasis will also be on the single most significant topological feature of eruptivity, namely, the magnetic polarity inversion line (PIL) and adjacent subregions in active regions, along with their size and intensity characterizations. How all these diagnostics, inferred as low in the solar atmosphere as vector magnetic field measurements exist, transpire to the overlying coronal volume will also be discussed. This is an action often overlooked, despite being necessary to enforce consistency between different physical layers, from where active-region observations and physically meaningful moments are available to where eruptions actually occur. A key question is how one might tell of imminent flaring activity or eruptivity in active regions, at physically meaningful timescales of hours or days before these instability manifestations. This question has physical and operational aspects, the latter in terms of space weather forecasting efforts, but we will be focusing on physics. Space missions along and beyond the Sun-Earth line, such as SOHO, SDO, STEREO and, to an increasing extent, Solar Orbiter and Parker Solar Probe, have also made important or even decisive contributions to our present understanding of solar active regions. We will sample key observations from these missions that have shaped this understanding and have enabled us to pursue further progress.

### Contribution Type

#### Theme

Connecting Solar Corona to Heliosphere

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