TITLE: Diagnostics of loop-like coronal structures

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We propose to use EUS time-series measurements of intensity *and* Doppler shift with co-aligned coronal imager observations near the equatorial regions of the Sun to study coronal (active region) loop-like closed structures. The spectroscopic observations should be done in upper transition region and coronal lines such as NeVIII, MgX. These are high cadence feature tracking-mode observations which should last for several hours. Our theoretical and numerical studies (Taroyan et al A&A 2006) have predicted the presence of distinct mHz peaks in the power spectra of the line intensity and line shift time-series. These peaks will allow us to better understand the multi-strand structure of the loops, determine important physical parameters such as the average temperatures of these structures, the average energies involved in the small-scale heating processes and the distribution of heating in time and space.

EUS instrument requirements

1. Emission line requirements

Ne VIII, Mg X and other strong coronal lines formed between 7x10^5 K and 3x10^6 K

2. Spectral resolution requirements

Profile needs to be resolved in order to study line widths.

3. Spatial coverage

A small part of an active region with a typical spatial size of around 50Mm x 50Mm.

4. Time resolution (incl. count rates)

Sit-and-stare exposures are required with at least 100 counts within an exposure time of 5 seconds per exposure.

5. Requirements for other instruments

The coronal imager should provide co-aligned observations of the same region..

6. Other requirements

Both the EUS and imager observations should last for at least 5-6 hours.

Relation to Solar Orbiter science goals

Indicate how your science fits in with the four Orbiter science goals. Simply type "N/A" if it's not applicable to a science goal.

1. **Determine the properties, dynamics and interactions of plasma, fields and particles in the near-Sun heliosphere**

N/A

2. **Investigate the links between the solar surface, corona and inner heliosphere**

The way in which energy is carried from the solar surface to the corona still remains a major problem in solar physics. Very little is known about the role of waves, e.g., Alfven waves, in this process. The proposed project will allow us to estimate the importance of such waves in carrying energies from the surface into the corona.

3. **Explore, at all latitudes, the energetics, dynamics and fine-scale structure of the Sun's magnetized atmosphere**

The proposed project is based on a novel method for the determination of the parameters of the solar coronal plasma. It will give us a new understanding about of closed loop-like multi-strand structures, the way they are heated and the energies involved in the heating events. This, in turn, will help us to understand the nature heating mechanism of these structures.

4. **Probe the solar dynamo by observing the Sun's high-latitude field, flows and seismic waves**

N/A