# ALFVEN WAVES IN SOLAR CORONAL HOLES


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Coronal holes are regions with open magnetic field structure. These regions are believed to be responsible for the fast solar wind. The heating of the solar coronal plasma and the acceleration of the solar wind is one of the greatest challenges in modern solar physics. Theoretical studies have shown that Alfven waves propagating along magnetic field lines are possible candidates which could explain these processes. Observations of Alfven waves in solar polar coronal hole regions are scarce and sometimes contradictory. The Solar Orbiter mission will provide an unprecedented view of the polar regions of the Sun. This will improve our understanding of the role played by the Alfven waves in such processes as the heating of the coronal hole regions and the acceleration of the solar wind. The EUS instrument could provide high spatial and temporal resolution line width observations covering different regions of the solar atmosphere. The analysis of the variability of the line width time series could give us important information about the power of Alfven waves at different heights, their frequency and the damping mechanisms.


## *EUS instrument requirements*

**1. Emission line requirements**

Bands 6 and 7a, which contain strong lines formed at 10^5 K and 10^6 K, should be used.

**2. Spectral resolution requirements**

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

**3. Spatial coverage**

A small sector of a polar coronal hole region should be covered.

**4. Time resolution (incl. count rates)**

The observations should be done in a sit-and-stare mode with exposure times between 1s and 10-20s. If the count rates are below 50, the exposure time could be increased up to 40s.

**5. Requirements for other instruments**

Vector magnetograms from VIM and EUI images at around 1MK temperature.

**6. Other requirements**

N/A

## *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**

The study will give us important information about the acceleration of the solar wind, the interaction of the Alfven waves with other waves and particles, the energy transfer mechanisms.

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

The study will allow us to estimate the energy flux carried by the Alfven waves, their generation mechanisms in the lower parts of the solar atmosphere and their damping in the outer corona.

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

The study will concentrate on the energetics and dynamics of the polar regions of the Sun.

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

N/A