One of the manifestations of solar activity is Coronal Mass Ejection (CME) i.e. rapid release of large amounts of solar plasma, energy, and magnetic field from the Sun and drive it into interplanetary space. Part of the CMEs reaches the Earth, causing disturbances in the Earth's magnetosphere and causing aurora borealis; therefore, they have an impact on space weather. Intense phenomena can cause damage to large areas, electricity transmission networks and pipelines and disrupt radio communications. They also pose a threat to an orbital infrastructure. CMEs are very often associated with other solar phenomena, such as prominence eruptions, solar flares, or X-ray ejections. CMEs are thought to be driven by the free energy stored in twisted or sheared magnetic fields, but the mechanism underlying the release of this energy remains a major unsolved problem of the heliophysics. To solve this problem the coronal magnetic configuration prior to the eruption must be better understood.

White-light observations of CMEs often show that CMEs possess the classic “three-part” structure: bright front; dark cavity which probably corresponds to the CME magnetic flux rope (MFR) and bright core, identified as an erupting prominence. A similar pattern is observed in quiescent structures: a coronal streamer that surrounds a dark cavity with a quiescent prominence inside. Such quiescent structures are observed mostly in the polar-crown regions, may be long-lived and exist in an equilibrium for many days or weeks. Even quiescent cavities and prominences may eventually erupt as a CME. Such CMEs are usually slower than CME connected with solar flares. The cavities that surround prominences contain much larger volumes, making them ideal candidates for the study of pre-eruption magnetic structures, in such cases the activation phase may last even a few days.

Cavities are dark structures with elliptical cross sections and a lower density compared with surrounding streamers. They may be observed in a wide wavelength range (white light, radio, extreme ultraviolet, soft X-rays). Observations in linear polarization are very interesting. Such observations of quiescent cavities reveal the common occurrence of a characteristic lagomorphic structure that may be explained with the existence od the twisted magnetic field (flux rope). Moreover, such observations may be used to determine what the configuration of the magnetic field is before and during CME eruptions and distinguish between different models. Other interesting structures observed in coronal cavities are flows in LOS. They are common and appear as a circles of distinct values of flow along the LOS that may be interpreted as a flows along the twisting magnetic fields. For non-eruptive cavities we measured temperature, and they are hotter than surrounding streamer, although plasma parameters should be analyzed during eruption to investigate their relationship with CME parameters (velocity, width, acceleration).

The cavities are visible throughout the solar cycle. Our research showed that almost 4,000 cavities could be observed over three years (the maximum, declining and minimum of the solar activity cycle). Some of them were certainly eruptive at the end, so they will allow for a very thorough examination of these phenomena.

The aim of this proposal is to answer following questions:

- How many erupting cavities can we observe? How does the visibility of coronal cavities depend on the strength of solar cycle? To answer these questions, we use ground-based observations, but also data from space telesopes.
- What ‘s the configuration of magnetic field before and during CME eruptions and how it influences on CME parameters (velocity, acceleration, width)?
- What are the plasma dynamics before and during the eruption and how is it connected with CME parameters?
- What are the plasma parameters before and during eruptions? In what part of the structure is the plasma heated? Is there any correlation between the temperature of cavity and CME parameters?
- Do CMEs for which the activation phase occurs slowly have plasma parameters similar to fast phenomena associated with more active phenomena?