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Internal structure and interactions of magnetic clouds at 1 AU

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Many of the observed coronal mass ejections (CMEs) have a distinct magnetic flux rope signature known as a magnetic cloud (MC). It is generally accepted that MCs are characterized by large magnetic field magnitude, slow magnetic field rotation and low proton density and temperature. MCs can interact with the ambient solar wind and by the time they reach Earth can become significantly distorted. This in turn can lead to deviations of their actual geoeffectiveness from the predicted one. In order to quantify and qualify the interactions we compare different reconstruction methods to estimate the physical properties of the MCs observed by the spacecraft positioned at 1 AU. We also take into account the actual state of the background solar wind. The obtained magnetic flux ropes parameters (e.g. cross section, twist and axis orientation) provide hints about the interaction between MCs and the solar wind and the resulting geoeffects. For example, magnetic flux erosion due to magnetic reconnection or presence of ambient turbulence can potentially reduce the geomagnetic impact of the MCs on the magnetosphere, while an interaction between high-speed streams with appropriate polarity with MCs can increase it.