



On the kinematics and thickness of the terrestrial bow shock

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The bow shock (BS) is formed due to the continuous interaction between the supersonic solar wind and the Earth's magnetosphere ahead of the magnetopause. Thanks to its proximity, BS is a perfect object to study a wide range of phenomena related to collisionless shocks and wave-particle interactions. We have analyzed more than 500 quasi-perpendicular BS crossings between 2001 and 2015 using data retrieved by the magnetometers aboard the four Cluster spacecraft. Applying a simple timing method to four-point measurement, we estimated the BS normal direction and velocity along this direction case by case. Next, we applied the Butterworth filter to numerical derivations of time-intensity profiles to estimate temporal sizes of BS magnetic ramps, and consequently spatial ones using obtained velocities. We have found that BS ramp scales are statistically around 50 km. We discuss relation between the BS ramp scales and both Alfvén and magnetosonic Mach numbers.