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Test of methods on determining axis and movement of plasma structures

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A self consistent analytical model was used to test the influence of affect parameter, noise level, satellite separation on the MVAB, MVAJ, Minimum Directional Derivative (MDD) and Spatial and Time Difference(STD) methods. It shows that, for the MVA methods, each eigen vector could be along the axial direction depending on the structure and affect parameter. The MDD results are influenced by the ratio of Noise level/separation to the gradient of the structure. Both paramethers$|\nabla \cdot B|/|\nabla \times B|$and ($|\lambda_1+\lambda_2+\lambda_3\ |/|\lambda_max|$) could be taken as quality indicator of MDD results when the satellite separation is less than half width of the flux rope. The turbulences/waves in the magnetic field data will seriously affect the results in the edge region, while the dimension and movement information in the core region with strong gradient can be true to represent that of the whole flux rope. Applications of these methods on real satellite data, which were further studied by GS method, were further compared and interpreted. It shows that the GS method can be more efficient in the case of clearly known of dimensionality and velocity of the structure.