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Detection of the spacecraft stray magnetic field: an approach based on dual sensor measurements for VEX

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A method for identification and correction of the variable spacecraft (s/c) stray magnetic field (MF) contribution in measurements of the ambient space MF is described, based on dual measurements with two sensors located at different distances from the s/c body. The time series of the differences of the measured components of MF at the two sensors is examined. Each step in the difference data corresponds to a switch-on/off event of one or more instruments on the s/c, producing a characteristic vector of differences assigned to each state of the s/c; the ambient space MF is superimposed to these step-like disturbances. The temporal variations of the two sensor differences are used for identification of jumps indicating the time of transition of the s/c system to another state. Two subsequent jumps define the interval of one state of the system. The average of the vector of two sensor differences during that interval is compared with those corresponding to the states defined in the training phase. A simplified approach assumes that all stray field variation effects can be characterized as step-like changes in the differences, to enable automation of the method of data analyzing and subsequent correction. The method requires a training phase performed on data from the s/c commissioning phase, defining the s/c states and their combinations by means of the differences in 3D space during the respective time intervals. For all s/c states the corrections to be applied to yield the ambient space MF on outboard sensor are determined. The application of the method is illustrated on existing dual sensor measurements. The limits of the approach are discussed for the the magnetometer measurements from the Venus Express s/c mission. First experience of using this method for data from comissioning phase of Venus Express is presented.