Automated recognition of jumps in GOES satellite magnetic data

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As a part of the space environment monitor instrument suite, Geostationary Operational Environmental Satellite carries two boom-mounted magnetometers that measure the local magnetic field vector with a 0.5 second sampling rate. These data contain occasional baseline perturbations not of geophysical origin. One source of contamination is due to switching heaters that are installed along with each magnetometer and used to stabilize the temperature of the instrument. Detection of the heater induced field is complicated by the fact that in most cases these jumps are so small that they are hard to distinguish visually. In the present work we have developed the algorithm JM (from JUMP) aimed at automated and uniform recognition of jumps in GOES 2 Hz vector magnetic measurements. We present the performance of the JM algorithm to a full day of measurements on 3 April 2010. On this date, almost all jumps were recognized by the JM algorithm. The results demonstrate that the algorithm might be used to improve the existing data set from GOES 13, 14 and 15 series, and perhaps find use with the next generation of GOES satellites, beginning with GOES 16 launched on 19 November 2016. *KEYWORDS:* GOES; satellite measurements; magnetic field; artificial disturbances; time series; magnetograms; pattern recognition; fuzzy logic; baseline jumps.

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1. Introduction

Over the last decades, the number and size of geophysical digital data sets have been rapidly increasing due to the expanding use of satellites and ground-based observational networks and an increase in sampling rate. Consequently, the role for automated tools for data handling and intellectual analysis is becoming more crucial. An expert is can deal easily with small amounts of data to extract useful information about geophysical phenomena; however, as data volumes increase, it becomes impossible to mine efficiently desired information, and other particularities, without adequate automated methods for big data analysis. Therefore, useful knowledge extraction needs to be formalized in an objective and uniform process.

Many geophysical studies rely on the analysis of observed time-dependent parameters in the form of one- or multidimensional time series. In geomagnetism, a prime source of information about the evolution of Earth's magnetic field are continuous

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