A three-dimensional magnetometer for motion sensing of a balloon-carried atmospheric measurement package

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Abstract: An instrument is described which carries three orthogonal geomagnetic field sensors on a standard meteorological balloon package, to sense rapid motion and position changes during ascent through the atmosphere. Because of the finite data bandwidth available over the UHF radio link, a burst sampling strategy is adopted. Bursts of 9 s of measurements at 3.6 Hz are interleaved with periods of slow data telemetry lasting 25 s. Calculation of the variability in each channel is used to determine position changes, a method robust to periods of poor radio signals. During three balloon ascents, variability was found repeatedly at similar altitudes, simultaneously in each of three orthogonal sensors carried. This variability is attributed to atmospheric motions. It is found that the vertical sensor is least prone to stray motions, and that the use of two horizontal sensors provides no additional information over a single horizontal sensor.

Year: 2007
Source title: Review of Scientific Instruments
Volume: 78
Issue: 12
Art. No.: 124501
Cited by: 1
Link: Scorpus Link
Document Type: Article
Source: Scopus

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