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Responses of the magnetic structure of the magnetotail to southward turnings of the IMF: Multiple observations

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The five Time History of Events and Macroscle Interactions during Substorms (THEMIS) probes lined up in the magnetotail along the Sun-Earth line on 25 January 2008. The solar wind monitors, Wind and ACE, observed two consecutive southward turnings of the interplanetary magnetic field (IMF) during the event. In the early period of the event, the magnetospheric Bx observed by P4 at X=-10.8 Re first responded to the first southward turning. The similar Bx change was observed by P3 at X=-10.6 Re in a 2-min delay, and by P1 at X=-8.7 Re in a 19-min delay. It indicates that the tail current takes a longer time to be built up at a closer position to the center of the Earth. Later, the magnitude of Bx decreased and then increased in response to the subsequent northward turning and then soutwhard turning of the IMF. The time sequence of the similar Bx change observed by the three probes is the same as that for the first southward turning. The implication of the time sequence will be discussed.