R O S E T T A

RPC-MAG Studies on Fake S/C-Disturbances: Cavity-Crossings

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Investigation on plasmaphysical and s/c related magnetic field jumps Mission Phase: ESC2-EXT2 Time: April 2015 - February 2016

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1 Cavity crossings

The Rosetta Magnetometer RPCMAG is very sensitive and therefore frail to magnetic field disturbances caused by the spacecraft itself. Reoccurring signatures of similar behavior on multiple occasions are the most promising hints to find spacecraft induced disturbances. Those signatures can be single magnetic field jumps in certain components of the measurements (e.g. Wheel off-loading), superimposed higher frequent oscillations on the measurements (e.g. Orbital Correction maneuver), steady increases and decreases of measurements over time (e.g. Antenna moving signatures) or combinations of them.

However, here we present a reoccurring jump signature that is not induced by the spacecraft itself. In the figures 1 to 5 the magnetic field components of the OB and IB-magnetometer, their time derivatives and the magnetic field magnitude are shown in nT and nT/s respectively. The *Cavitiy Crossings* are identified as jump-like signatures after the spacecraft crosses into (black vertical line) or out (orange vertical line) of a magnetic field free volume around the comet that lacks an interior magnetic field. However, between the black and orange line the magnetic field never diminishes completely because of the magnetic offset of the magnetometer.

Shown by a blue vertical line are the intense jumps that range from 10 nT up to 70 nT in either the components or total magnetic field. Important to note is the very similar jump strength behavior measured by both, the OB and IB magnetometer. Thus we can conclude that the disturbance must happen outside of the s/c.

The sudden changes happen within seconds and can be noticed in the time derivatives as well, see figures 1 and 5. Sometimes the cavity region moves and sequential jumps can be measured as seen in figure 2. Figure 3 is shown as an example of a smaller jump. In some cases multiple minutes between the "end of the cavity" and the jumps can be observed as seen in figure 4 and 5

The analysis of the underlying physics, shape and intensities of all those boundary crossings are done by the MAG team and should be published soon.

2 Cavity crossing Examples

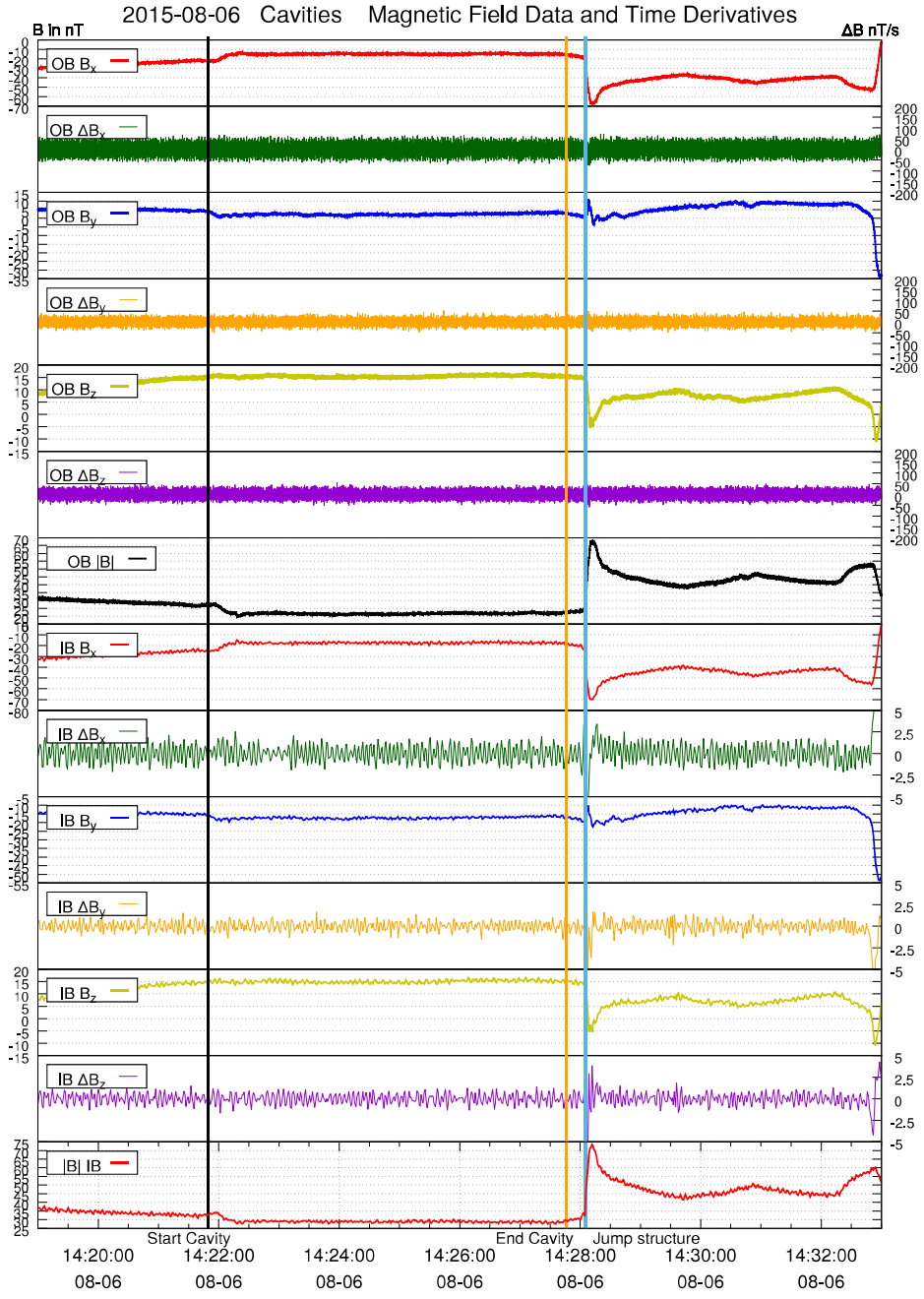

Figure 1: Cavity crossing at 14:28:05.

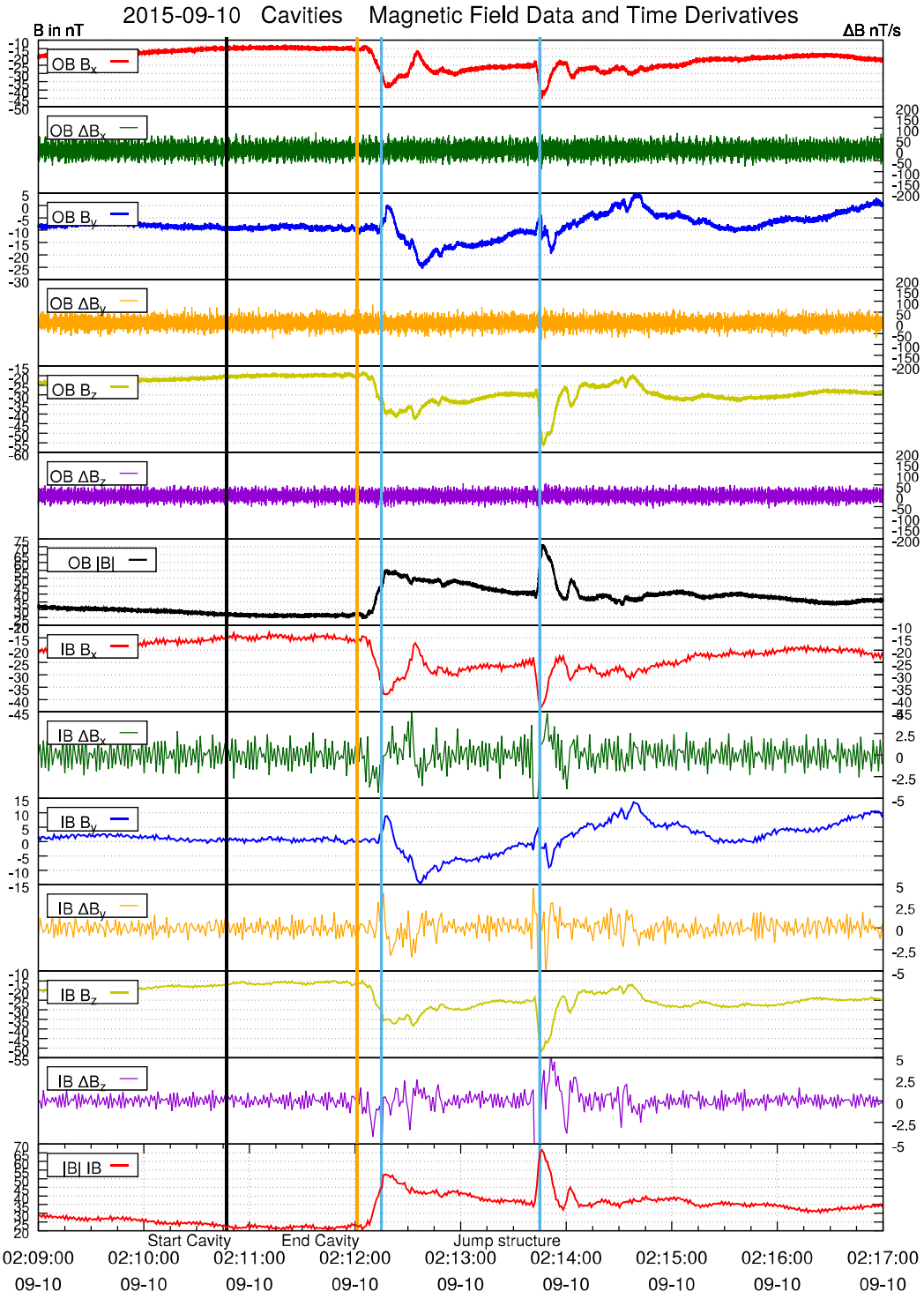

Figure 2: Sequential cavity crossing at 02:12:15 and 02:13:45.

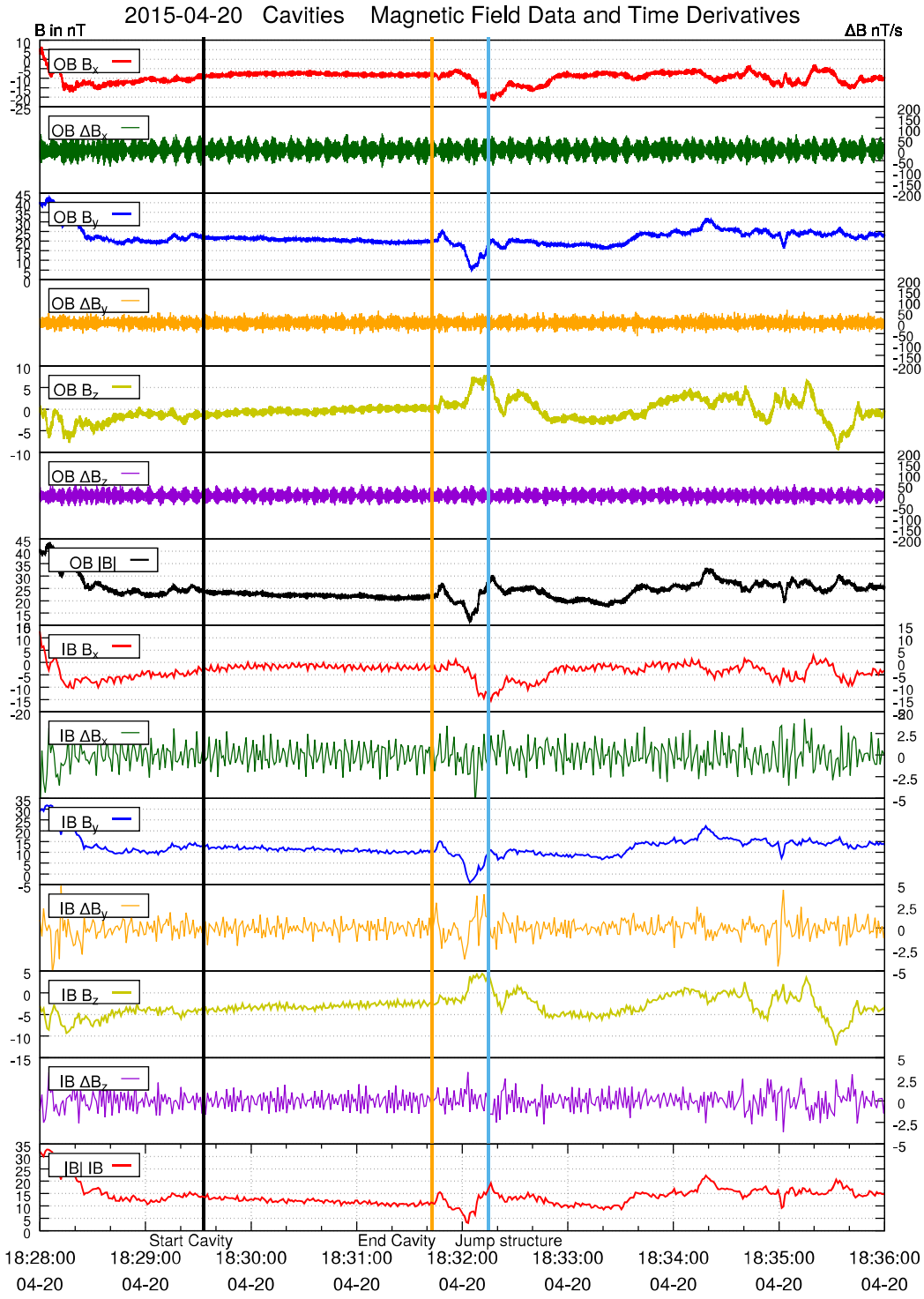

Figure 3: Cavity crossing at 18:32:20.

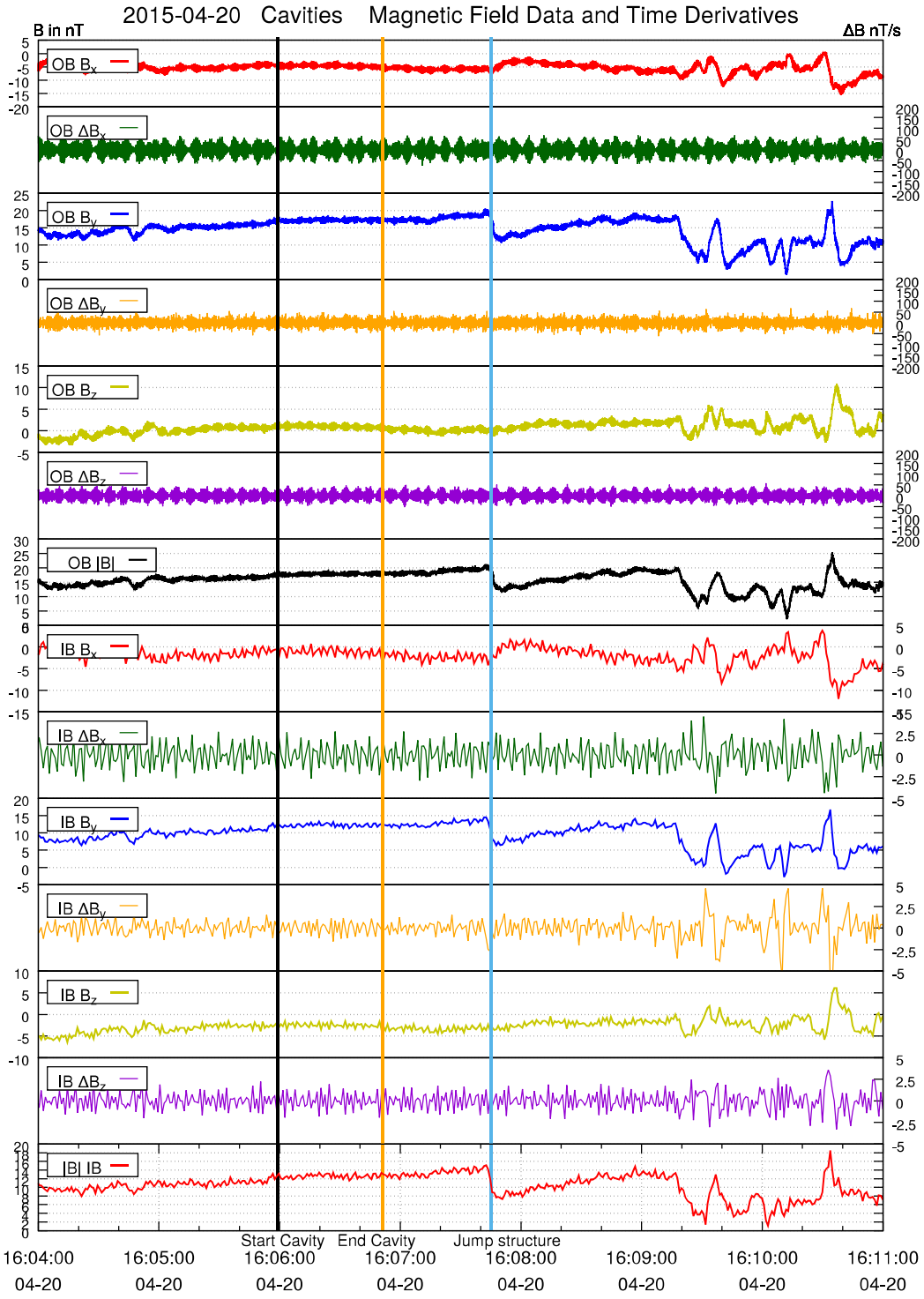

Figure 4: Cavity crossing at 16:07:40.

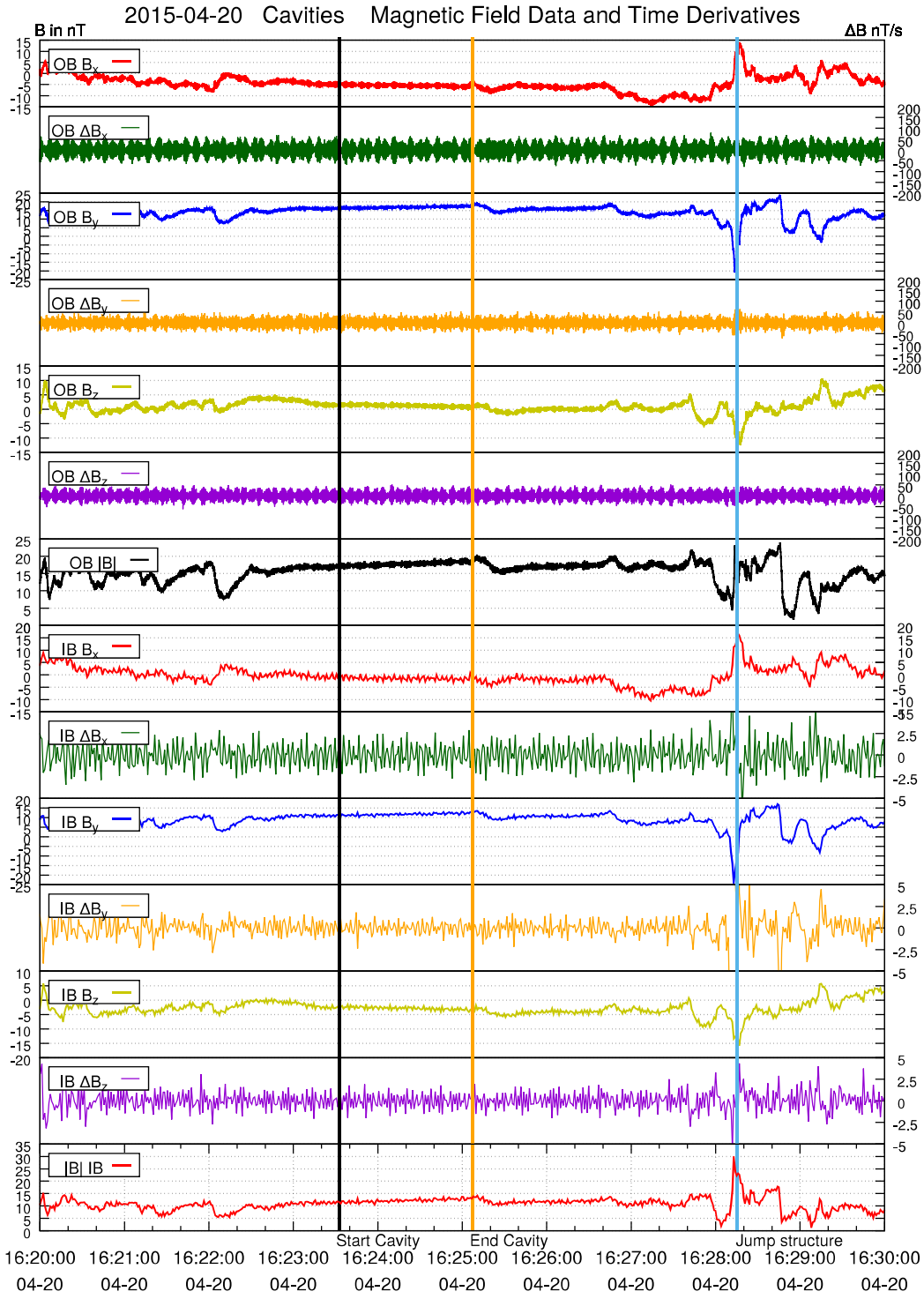

Figure 5: Cavity crossing at 16:28:15.