

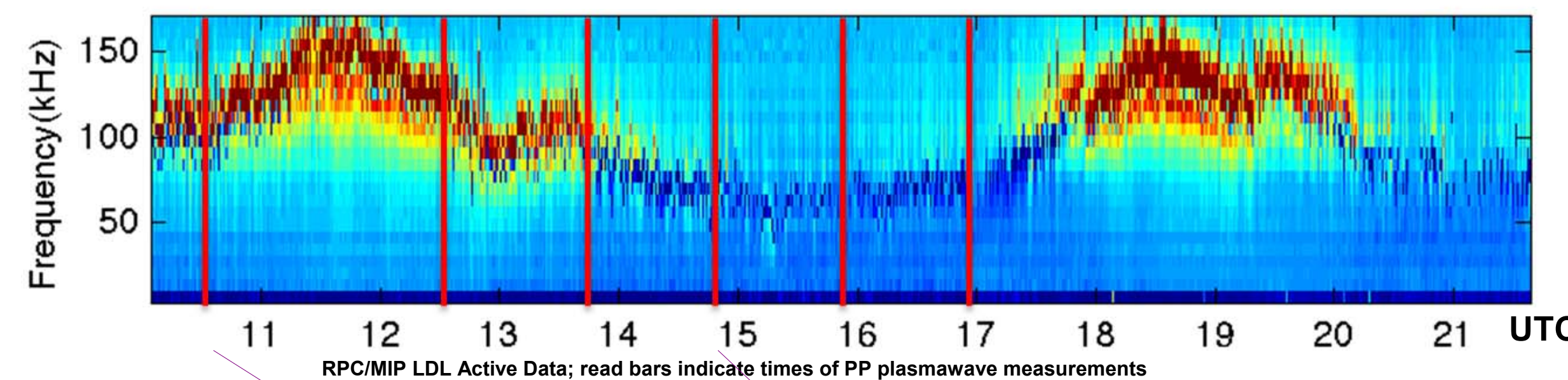
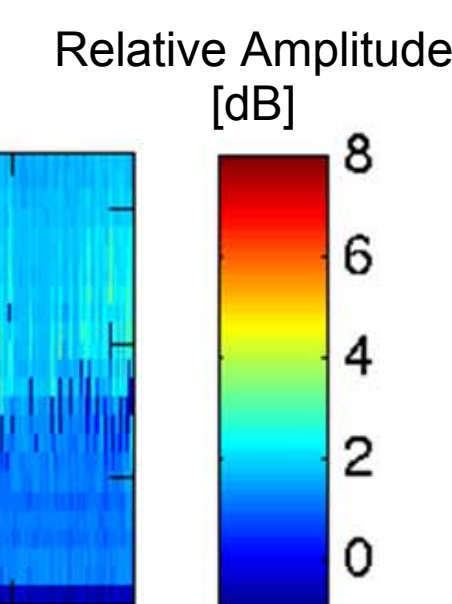


Plasma properties at 67P/Churyumov-Gerasimenko: A comparison between PP-SESAME/Philae/Rosetta and RPC/MIP/Rosetta

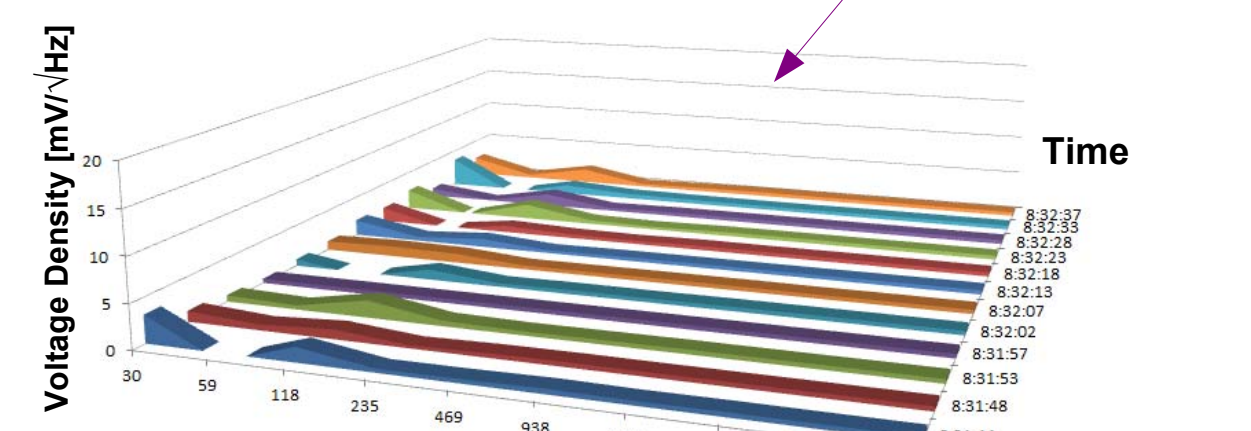
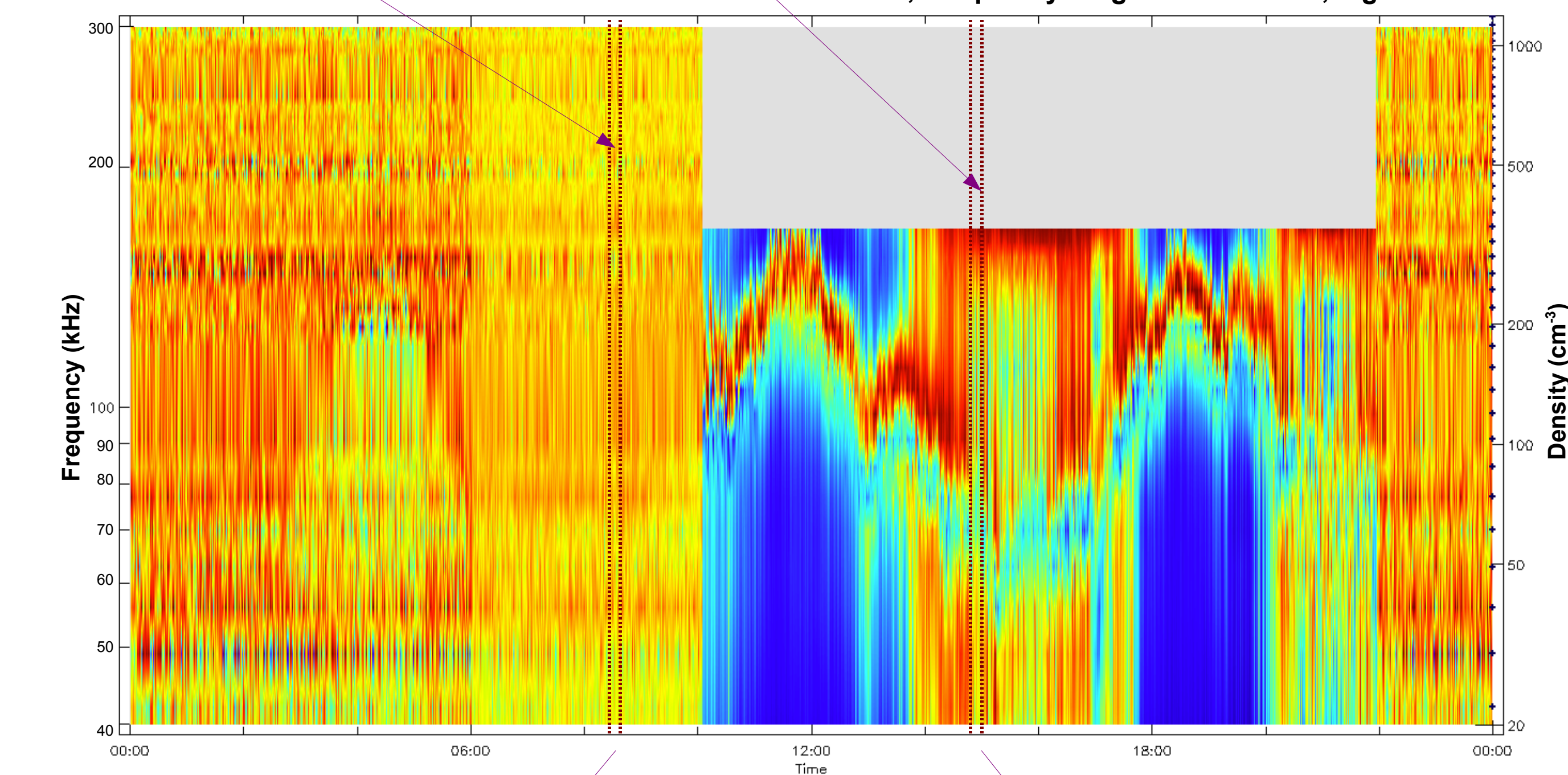
Walter Schmidt, Pierre Henri, Jean Pierre Lebreton, Xavier Vallières, Réjean Grard, Michel Hamelin, Alice Le Gall, Anthony Lethuillier, Valerie Ciarletti, Sylvain Caujolle-Bert, Klaus Seidensticker, and Hans-Herbert Fischer
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Pre-Delivery Calibration and Science (PDCS) Operations: Plasmawave measurements 17.10.2014

Distance CG – Sun: 3.17 AU, distance Rosetta to CG: 4-8 km

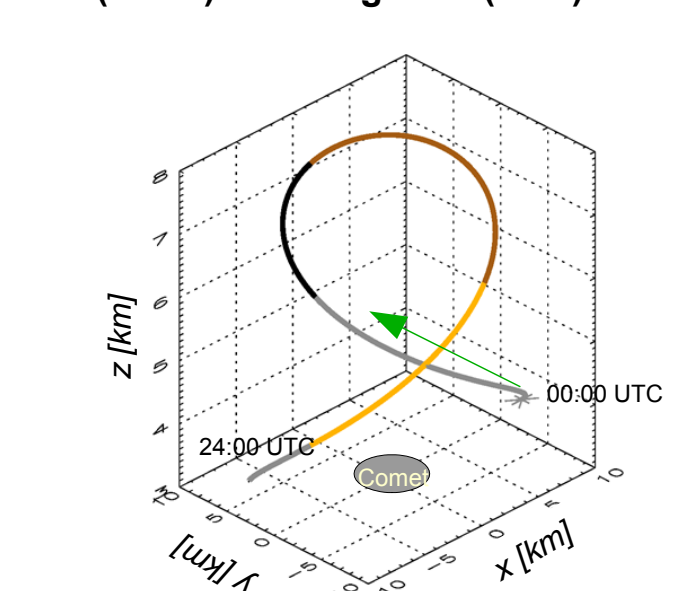
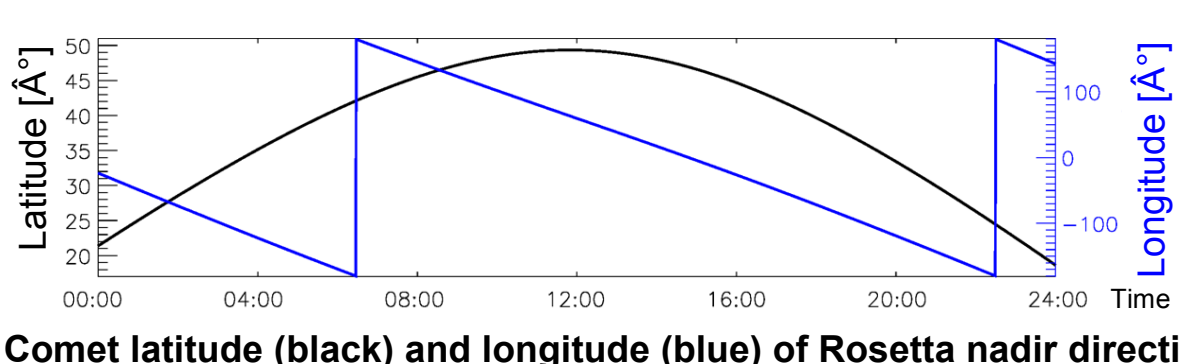


RPC/MIP SDL Power: 2014/10/17 00:00 – 24:00 UTC, Frequency range: 40 – 300 kHz, log



PP Plasmawave measurements

MIP shows only high frequency components
PP does not see any activities below 20 kHz



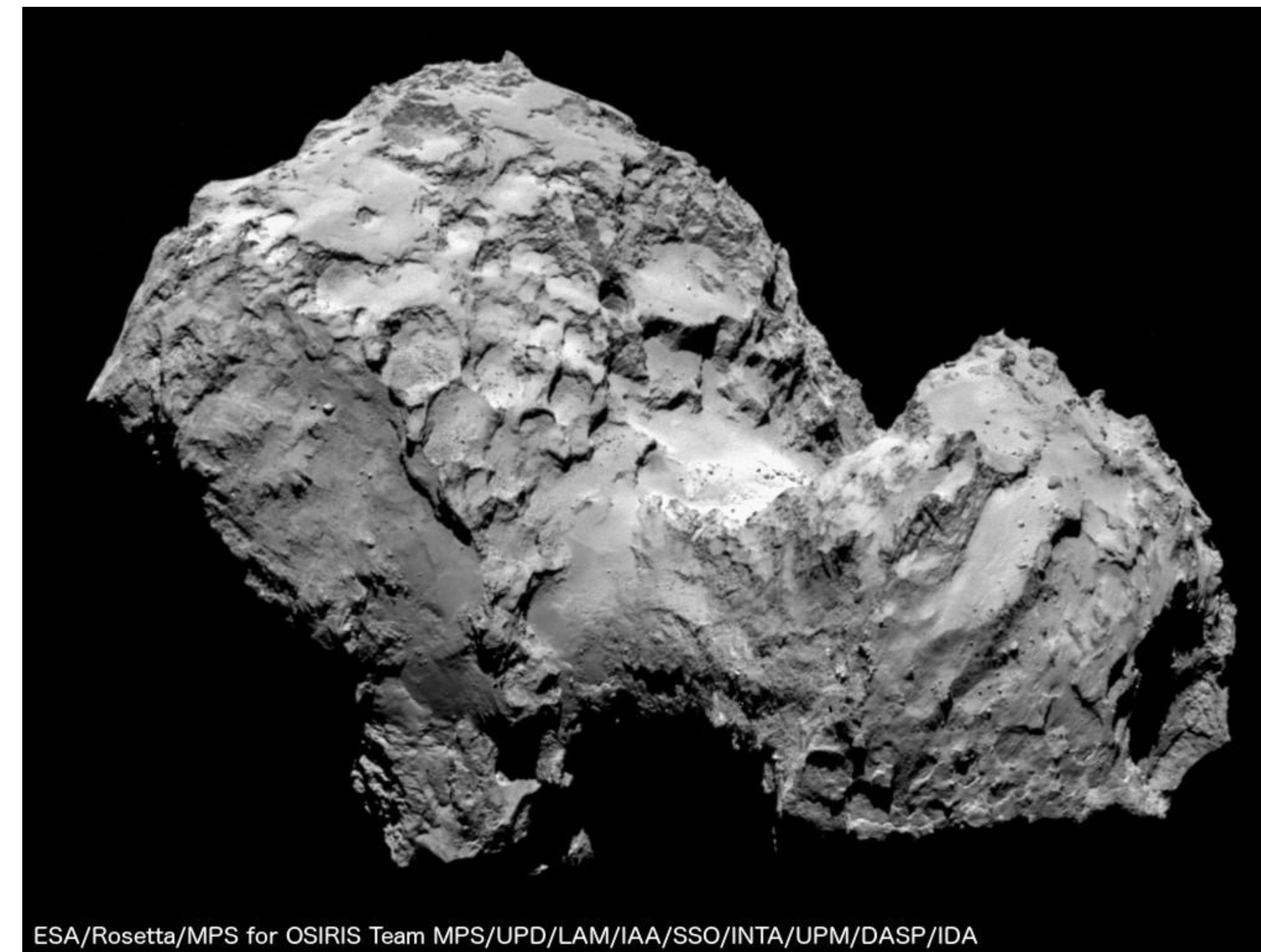
Rosetta's trajectory around the comet
Distance ~ 4 - 8 km

PP Plasmawave measurements

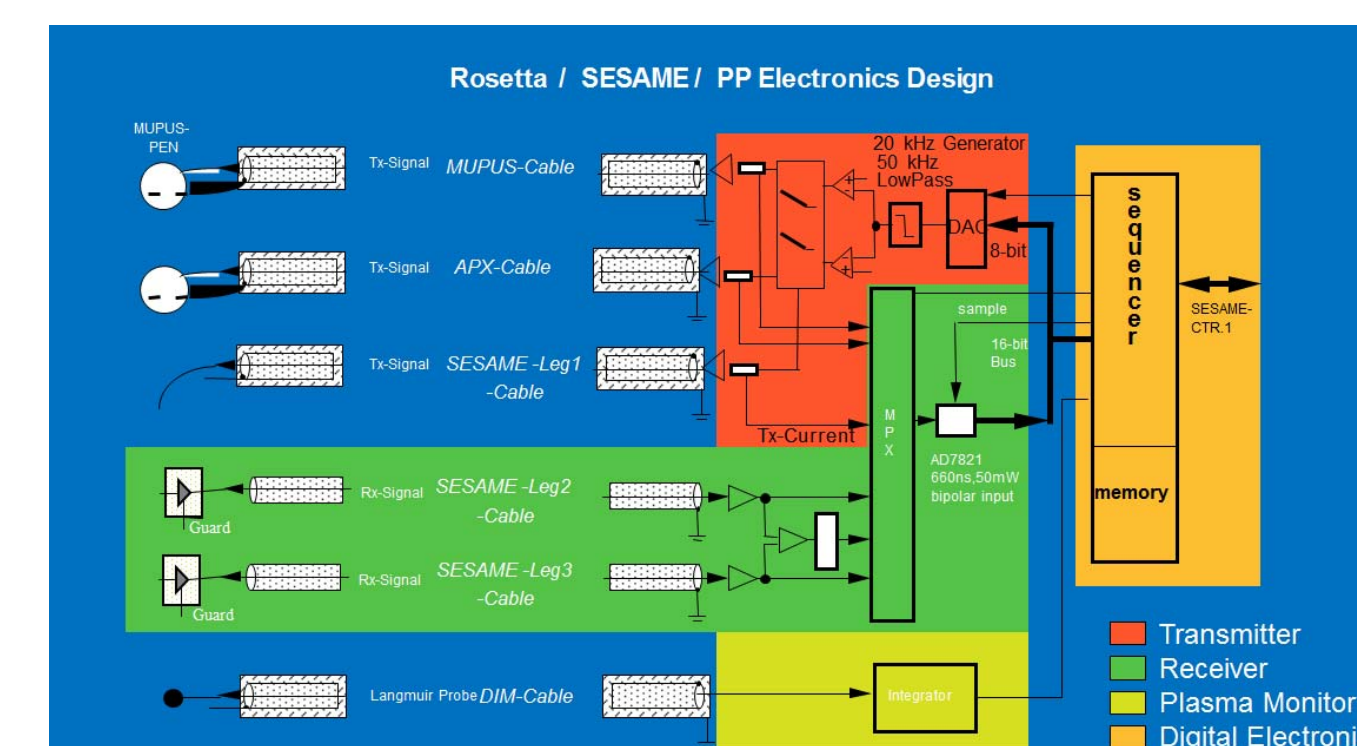
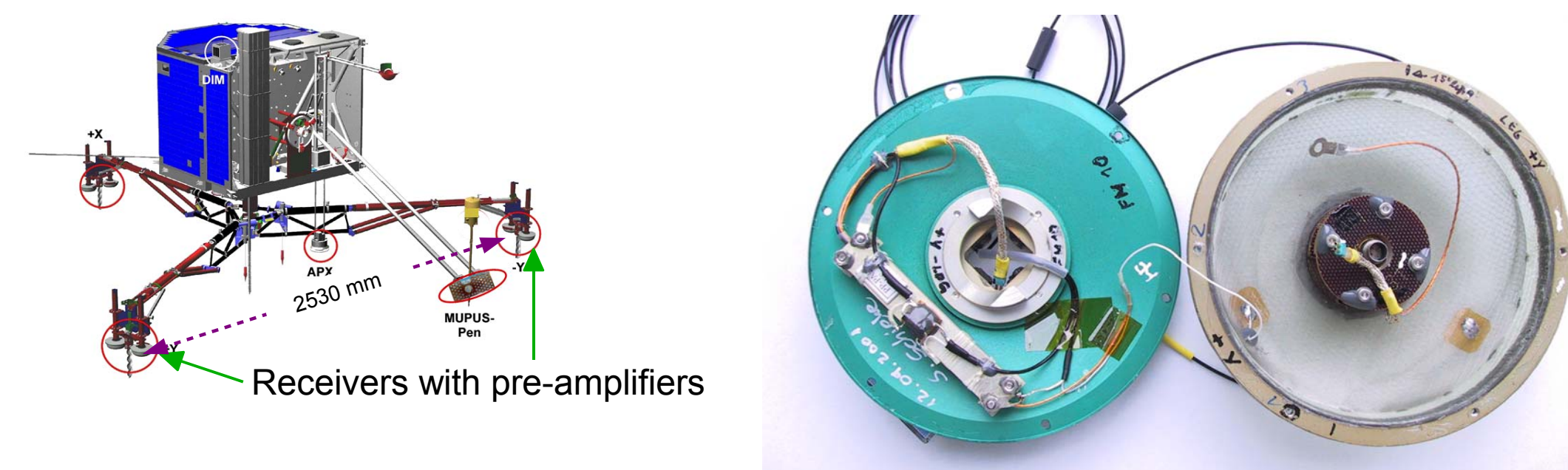
MIP shows drop to lower frequencies;
PP: strong increase starting at 500Hz, dropping to 100 Hz
5 seconds later
Peaks below 50 Hz are related to tests with Philae's
flywheel running between 0 and 30 Hz

MIP measurements:

Active measurements:
Short Debye Length mode ("SDL"): Transmitter and receiver are on the MIP boom
Long Debye Length mode ("LDL"): As transmitter the LAP transmitter electrode is used
Frequency range 7 kHz to 3.5 MHz
Plasmawave sensitivity: 1 mV / m / SQRT(Hz) at 100 kHz



Permittivity Probe for Plasmawave Measurements



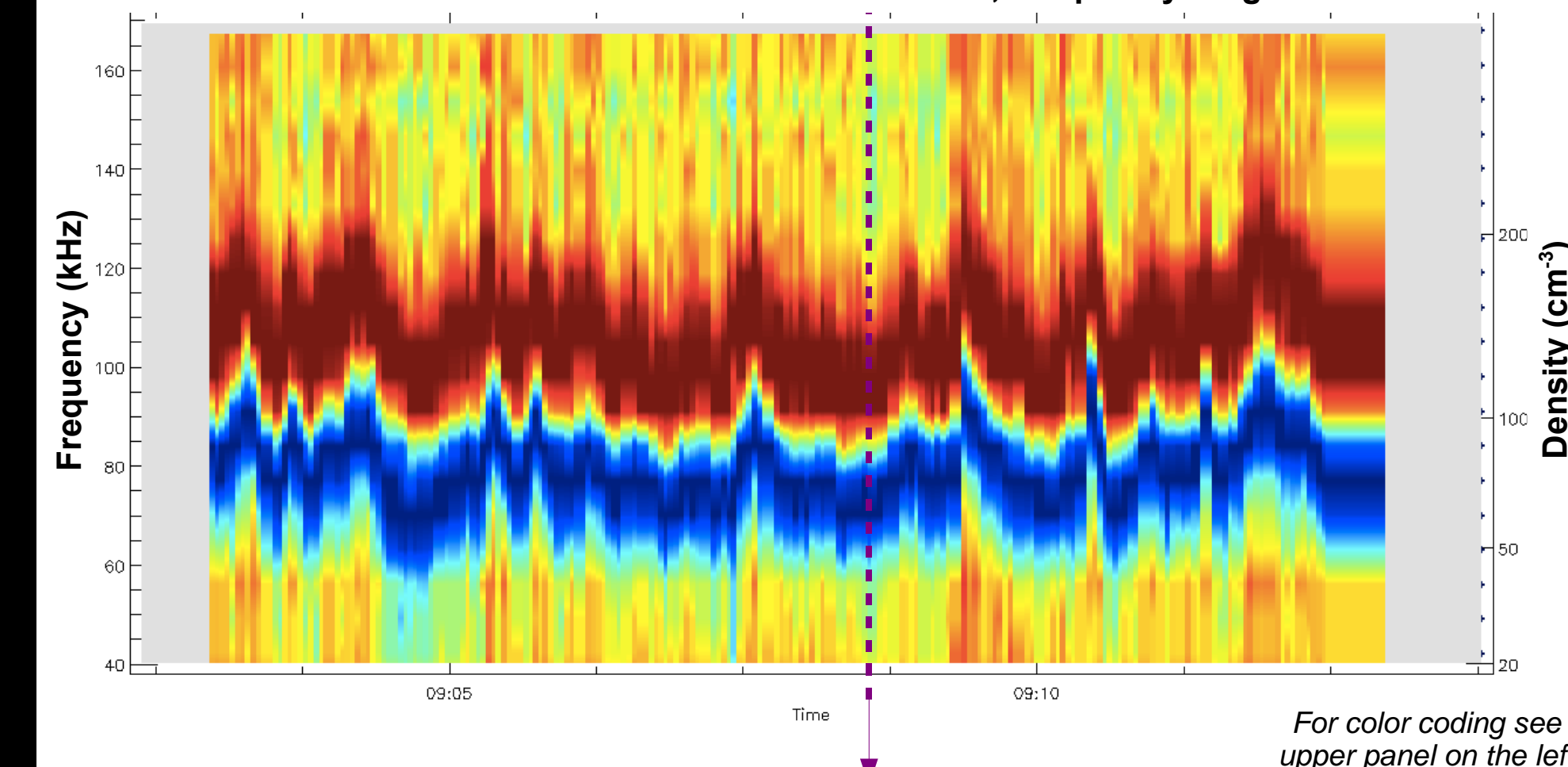
Sensitivity of PP differential receiver:
Dynamic range: -119 mV to +119 mV
Resolution: 0.934 mV

Plasmawave measurements:

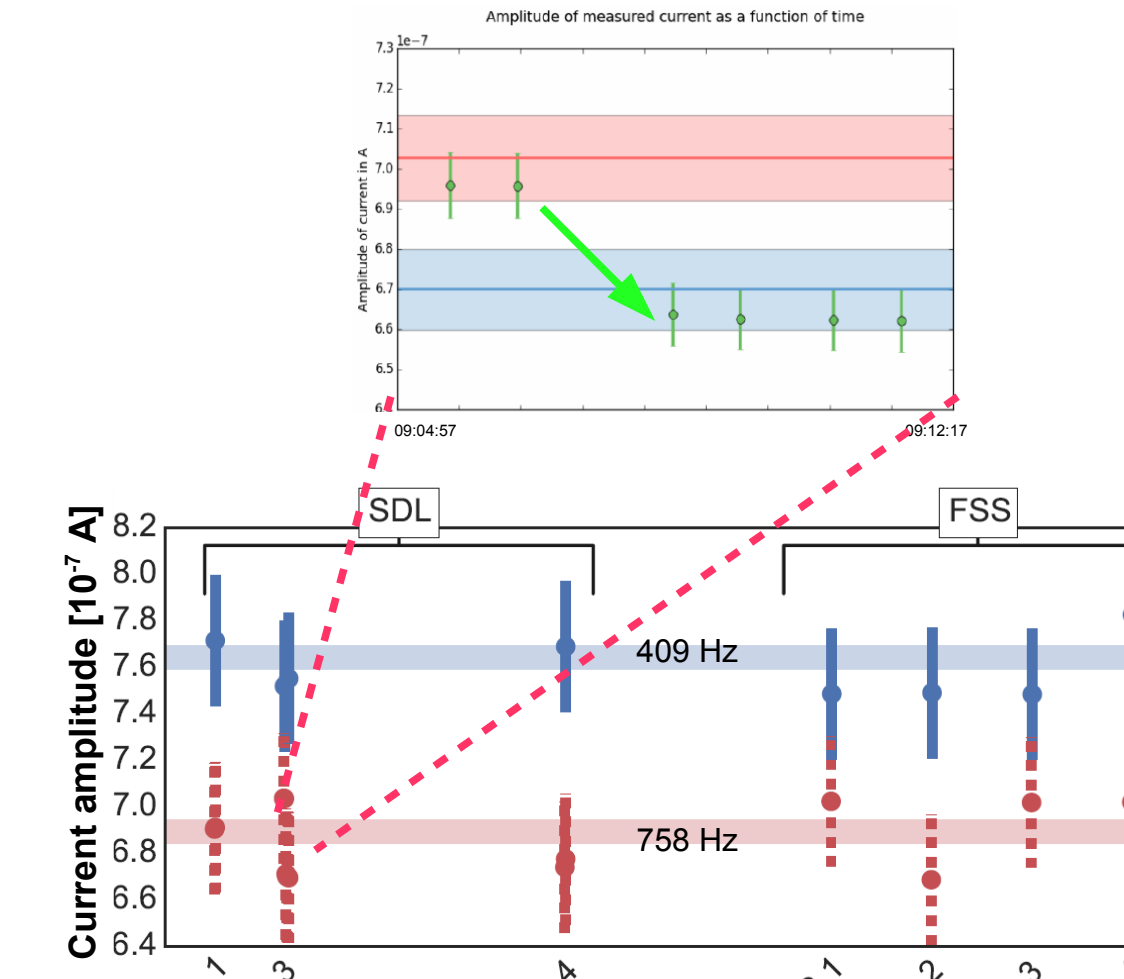
Sample frequency: 40 kHz
Number of samples: 8192
Onboard processing: Wavelet-based binned power density calculation with logarithmic bin distribution
Number of spectral bins: 10
Frequency ranges:
Bin 10: 20-10, bin 9: 10-5, bin 8: 5-2.5, bin 7: 2.5-1.25 kHz
Bin 6: 1250-625, bin 5: 625-315, bin 4: 315-157 Hz
Bin 3: 57-78, bin 2: 78-39, bin 1: 39-(10) Hz

Separation, Descent and Landing (SDL) 12.11.2014 starting 08:35 UTC

RPC/MIP LDL Power: 2014/11/12 09:02:23 – 9:13:47 UTC, Frequency range: 40 – 300 kHz



For color coding see upper panel on the left



The observed current drop during SDL 3 seems to indicate a decrease in electron density at an altitude of about 18.5 km above the comet surface. Re-evaluating the error bars of the measurements this observation is most likely not significant. MIP data do not show any signature though it is only about 3 km higher than Rosetta at that moment.

Note: The frequency generator amplitude for 758 Hz is only 50% of the one for 409 Hz to ensure that the current measurements remain inside the dynamic range of the monitor. Therefore the recorded current level is lower at the low plasma density during the descent.

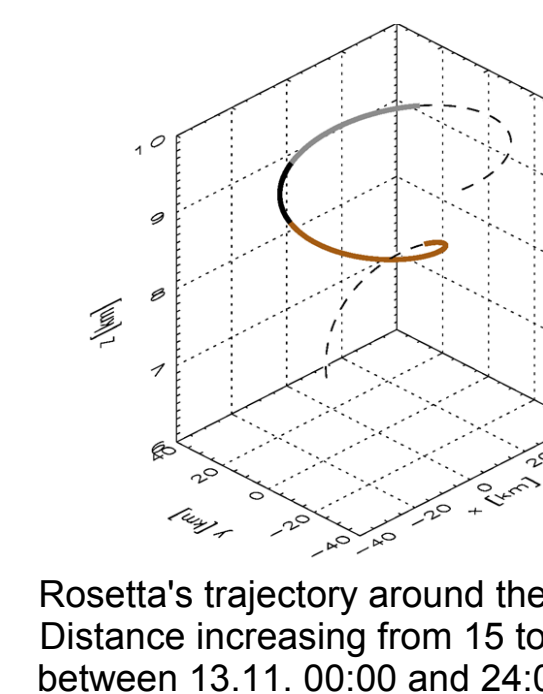
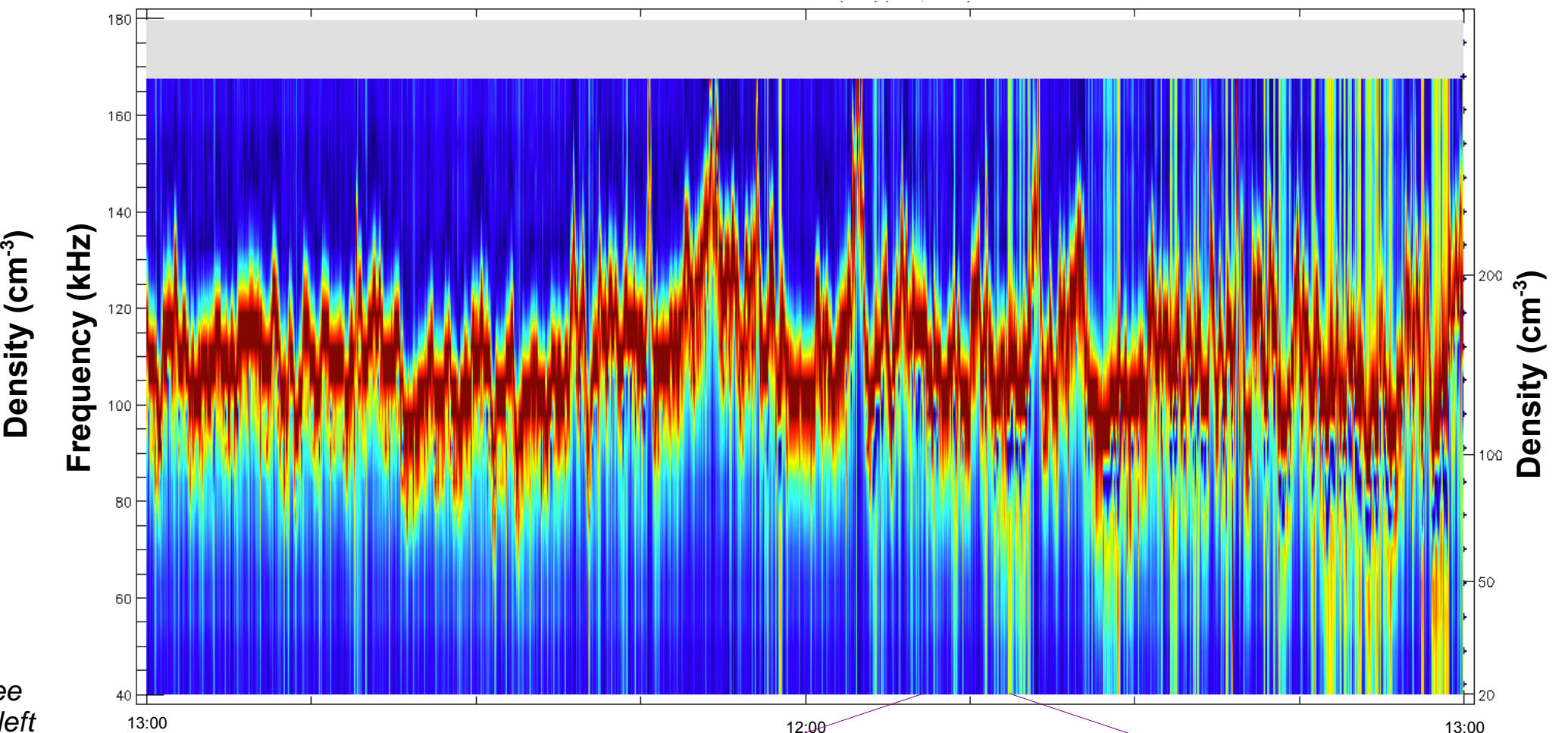
During FSS-1 shortly after local sunset PP initially does not observe wave activities.
From FSS-2 onwards frequencies between 200 and 500 Hz start to appear.

A maximum around 118 Hz appears in the beginning of FSS-3 (plotted transparent to show later signals)
Signals decline again during FSS-4. During all FSS PP-measurements Philae was already fully in shadow.
The plasma changes indicate surface activities in the vicinity of Philae's location, possibly linked to the intensity increase for low frequencies MIP recorded at 12:14 and 12:17.

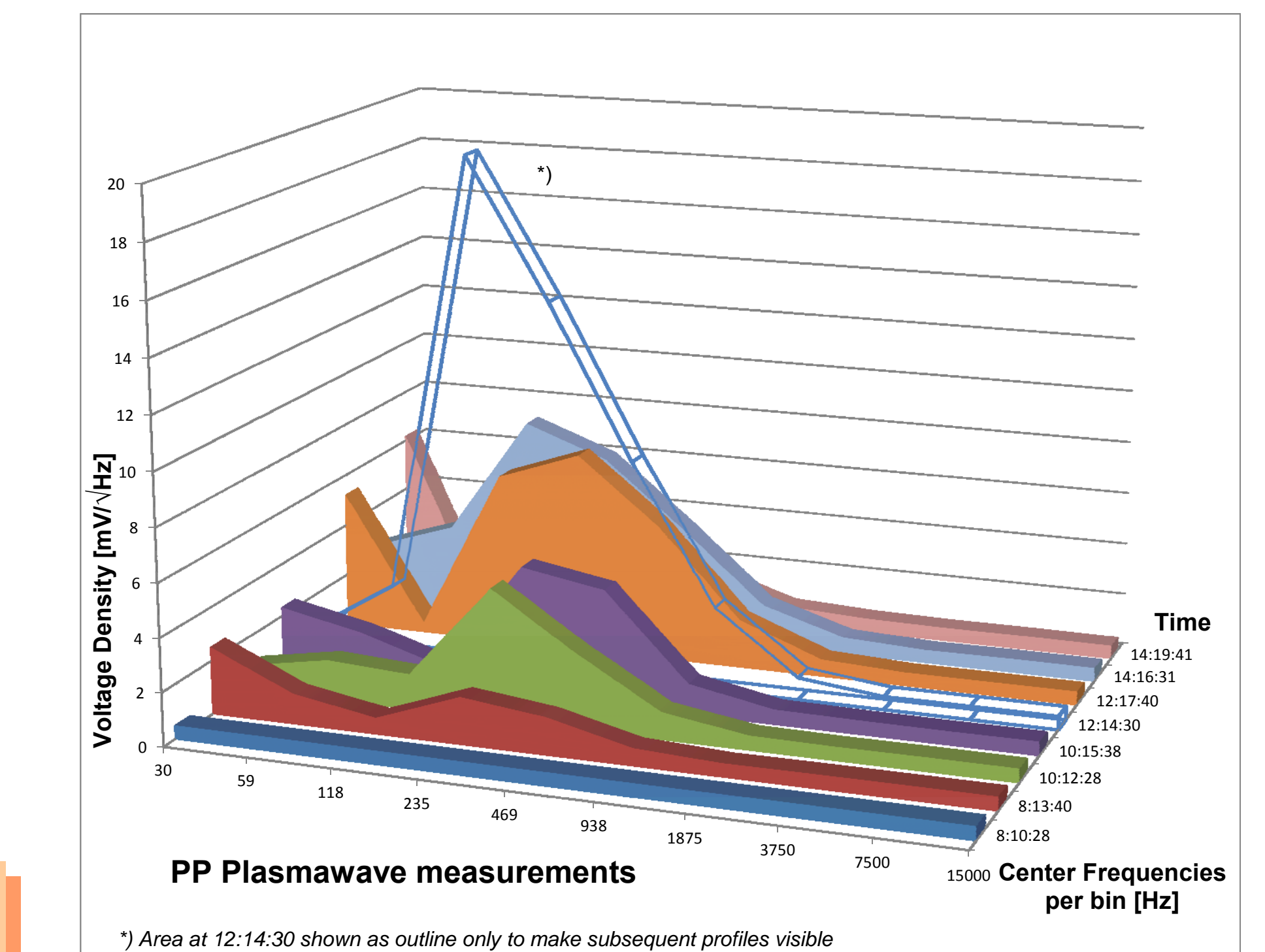
No other possibly distortion generating activities were performed on Philae during the time of measurements. The parallel measurement activities of the magnetometer ROMAP and the temperature sensor of MUPUS were identical during all four FSS measurement intervals.

First Science Sequence (FSS) 13.11.2014 08:10, 10:12, 12:14 and 14:16 UTC Distance CG-Sun: 2.99 AU

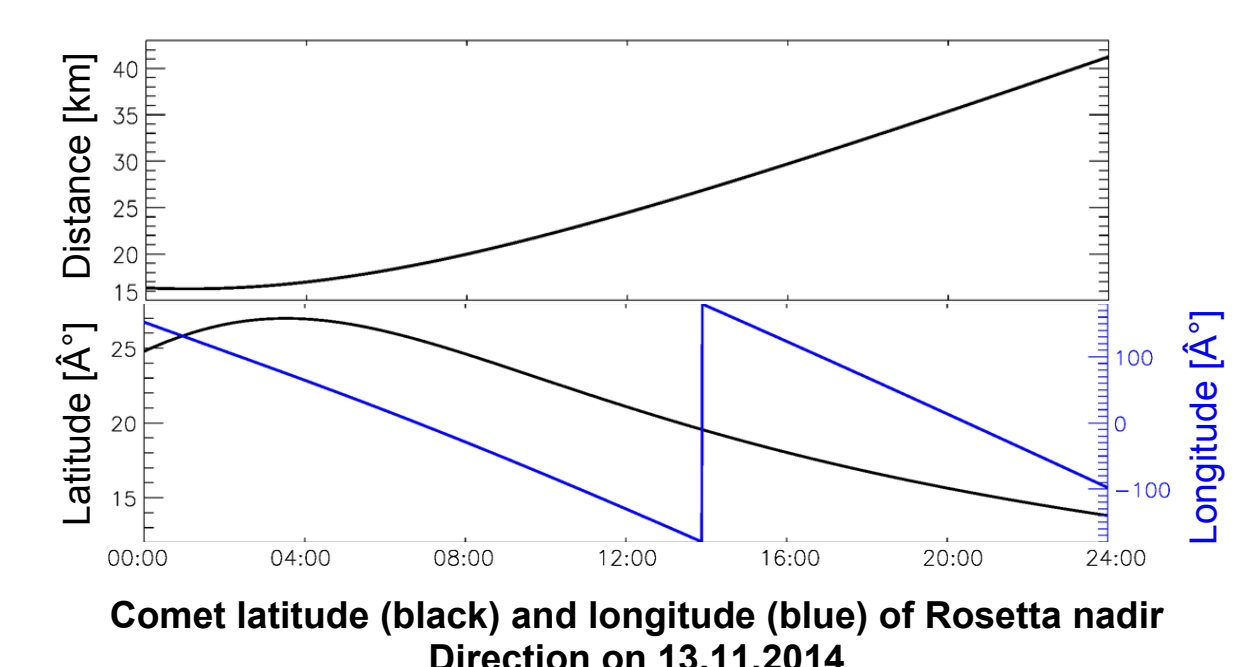
RPC/MIP LDL Power: 2014/11/13 11:00 – 13:00 UTC, Frequency range: 40 – 180 kHz



Rosetta's trajectory around the comet
Distance increasing from 15 to 40 km
between 13.11.00:00 and 24:00 UTC



*) Area at 12:14:30 shown as outline only to make subsequent profiles visible



Comet latitude (black) and longitude (blue) of Rosetta nadir
Direction on 13.11.2014

Acknowledgements: SESAME is an experiment on the Rosetta lander Philae. It consists of three instruments CASSE, DIM and PP, which were provided by a consortium comprising DLR, MPS, FMI, MTA, FHG, Univ. Cologne, LATMOS and ESTEC.
The development of PP was supported by grants from TEKES, the Finnish Funding Agency for Innovation, and the Academy of Finland



For More Information:

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SESAME/PP
Web-site at FMI

