



Mars Express Observations during Comet Siding Spring Mars Fly-By

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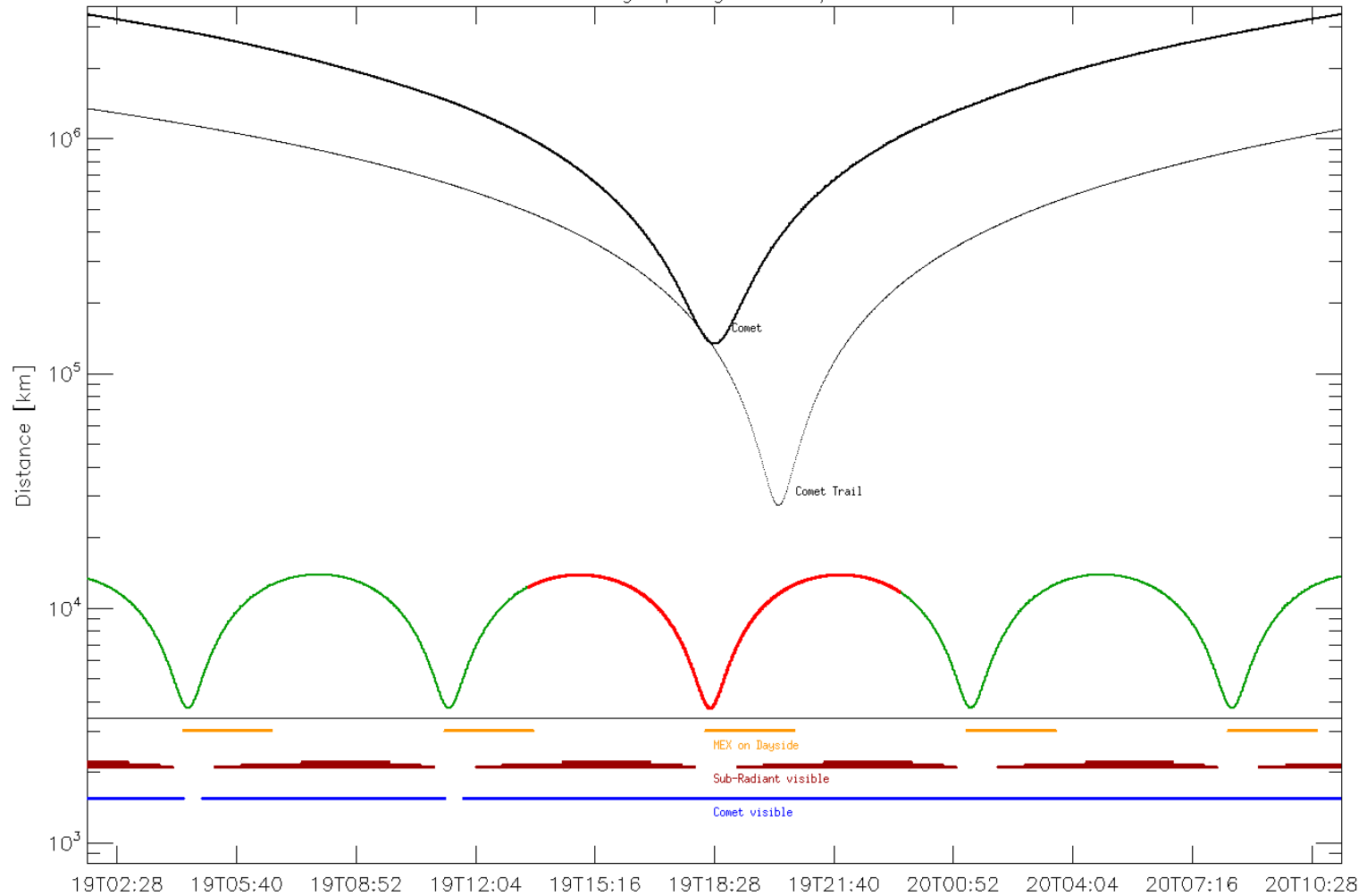
- The Siding Spring flyby of Mars 19 October is a truly unique event. It offers invaluable opportunities for scientific observations in several fields
 - Direct close-up observation of an Oort Cloud comet
 - Observation of the cometary coma in several modes
 - Observation of the atmosphere of a planet under the direct influence of the gas and dust of the cometary coma
 - Observation of the three party interaction Planet-Comet-Solar wind

Distances MEX - Mars and Comet - Mars



kdnatz18533.png

Siding Spring C2013/A1



CA: 2014-10-19T18:28:00

S-S MEX planned observations



➤ SpicaM

- Direct observation of coma
- Estimating amount of H₂O gas in coma
- Stellar occultation of coma, composition
- Brightening of Mars H corona
- Mars limb observation

➤ Marsis

- Ionospheric measurements (ionogram - meteor layer)
- Direct dust impacts on antennas and/or spacecraft

S-S MEX planned observations



➤ Aspera

- Direct detection of cometary ions and neutral particles
- Study of interaction of atmosphere with cometary material
- Study of effect of solar wind on cometary coma

➤ PFS, Omega

- Observation of opportunity

➤ VeRA

- Not used

S-S MEX planned observations



- HRSC, using SRC channel
 - Direct observation of the nucleus (1.3 km/px)
 - Optical properties, structure and development of coma
 - Meteors in Martian atmosphere (see next slide)



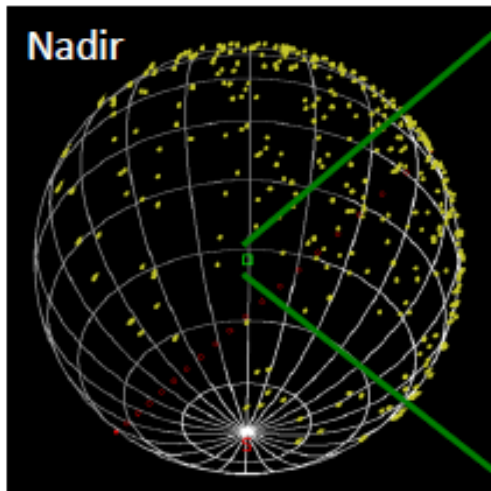
➤ Meteor Observation HRSC:

- Meteoroid statistics (Magnitude / frequency relationships)
- Temporal / spatial distribution
- Meteor characteristics
- Beginning- and end height *) **)
- Break-up?
- After-glow?
- Do the small cometary meteoroids hit the surface?
- Impact flash magnitudes?

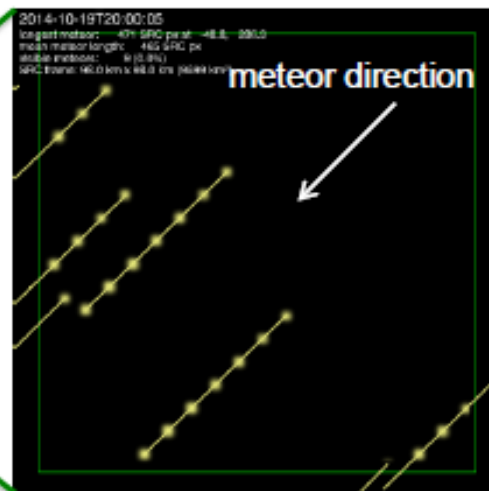
*) Note: Terrestrial meteors occur in the upper atmosphere, ~ 80-120 km; atmospheric density in Earth's upper atmosphere corresponds to Mars atmospheric density near surface (!)

**) As the orbits, radiant and speeds of the stream meteoroids are known, meteor trajectories can be fully reconstructed

Geometry (meteor observations)

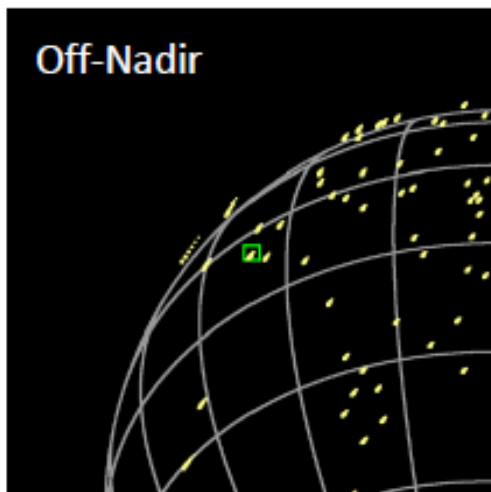


Nadir

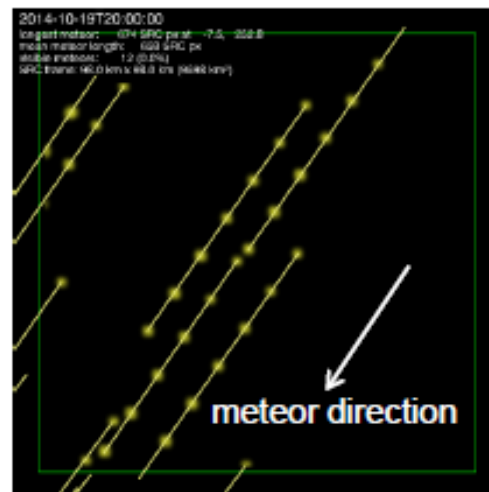


Nadir

- Incidence angle: 48°
- Meteor length: 465 pixel (~60 km)
- Duration: 1.1 s



Off-Nadir



Off-nadir

- Incidence angle: 66°
- Meteor length: 658 pixel (~95 km)
- Duration: 1.7 s

SRC frame, example from distance: 10,500 km
Meteor speeds: ~ 56 km/s
Beginning height: 90 km
End height: 50 km

Duration of Meteor: ~ 1.5 s, i.e., meteor may be seen in 2-3 consecutive SRC frames

Comet Siding Spring

Summary of Science observations



➤ Siding Spring optical observations

- 12 observations HRSC SRC, OMEGA-VIS, PFS and SPICAM:
 - 13689, 13692, 13695, 13697a, 13701a, 13705, 13706, 13707, **13709**, 13710b, 13713, 13714

➤ Meteoroid search optical observations

- 2 observations HRSC SRC, OMEGA-VIS and PFS:
 - 13710a and 13711

➤ Atmospheric limb monitoring

- 9 SPICAM+PFS occultations, in-plane limb low altitude (0-2000km), south hemisphere :
 - 13706b, 13707a, **13709b**, 13710a, 13711, 13712ab, 13714a, 13715ab
- 4 SPICAM+PFS aeronomy, tangential limb low altitude (90-2000km), south hemisphere:
 - 13708, **13709c**, 13712b, 13715a(no PFS)
- 3 SPICAM+PFS exosphere, Hydrogen corona, in-plane high altitude limb (2000-5000km)
:
 - 13703c, 13716, 13765.

➤ Ionosphere monitoring

- MARSIS Full AIS observations (as long as possible) for 10 orbits: 13706-13715

➤ Magnetosphere monitoring

- ASPERA continuous monitoring whenever possible.

Comet Siding Spring MEX Timeline at Closest Approach



Comet Closest Approach ~138000 km @2014-10-19T18:27

