OPTIMUM OBSERVING STRATEGY FOR THE ASSIMILATION OF ATMOSPHERIC DATA



Manish Patel Steven Greybush Sandrine Guerlet

Aims and outcome



- Assuming a new mission possibility, how do we optimise for data assimilation in terms of:
 - Orbit
 - Instrument observing strategy
- This is all existing knowledge the aim is to capture all the knowledge and collate into potential future plans....

Ultimately, define an approach that has data assimilation as highest priority



- Which phenomena do we want to address?
 - Atmospheric tides
 - Travelling waves
 - Dust cycle
 - General transport
 - ...
- Different observing strategies for different phenomena?



ORBIT TYPE





- What are the most basic key factors that define the optimum orbit?
 - Local time of nadir track (fixed, variable, specific times?)
 - Geographical coverage
 - Time to orbit closure
 - Polar orbiter, areostationary satellite, other?
 - Any others?
- Viewing geometry: limb or nadir?

Local time of observations



- Fixed local time, or variable?
 - A drifting local time is preferred for diurnal pattern coverage
 - Is there a preference for fixed local time relating to any specific processes?
- Rate of change of local time
 - Is there a preferred rate of change in terms of nadir track evolution?
 - What is the science case for areostationary satellite (all local times covered)?

Ground coverage and time to orbit closure

- What coverage is needed:
 - Complete coverage of the whole surface? (taking a long period of time, e.g. 30 sols)
 - Or partial coverage repeated over shorter durations? (~5 sols)
- What would be the acceptable:
 - Nadir track longitude gap in coverage?
 - Repeat duration?





MEASUREMENT STRATEGY

Sampling cadence



- What is the optimum manner in which to acquire observations?
 - Bursts of high frequency observations interspersed with gaps
 - Constant lower frequency measurements
- How does the acquisition of observations depend upon the atmospheric process under investigation?
 - General transport
 - Gravity waves
 - Planetary waves
 - Atmospheric tides
 - ...
- If so, what is the minimum cadence needed to accurately characterise each one via DA?

Acceptable gaps



- For mapping of atmospheric species, what is the maximum acceptable gap between observations for
 - Passive species
 - Active species
 - H_2O
 - O₃
 - ...

Other observations



- Develop a network of ground-based stations on Mars for DA and/or validation
 - Temperature, winds (including lidar measurements)...
 - What added value?



Any other considerations that have not been covered?