Data assimilation on Mars

- **Goal: optimal representation the atmosphere combining observations and model.** One output if the model is well driven : forecast.

Data assimilation needs to drive and correct the model for 5 reasons:

- **The model is missing a process or is wrong.** Modeling does not help

=> all DA can do is interpolate data, lots of data needed.

Example: dust vertical distribution in current models

- **Unknown Model parameters must be tuned to be good**:

Example : Microphysic, gravity waves parameters

⇒ *Data assimilation can be used to estimate the parameters.*

With a "perfect" atmospheric GCM data assimilation still needed because:

- **Chaos in the flow:** Data assimilation always needed. *Example on Mars: travelling waves evolution*.=> Dominate on the Earth but not on Mars
- **Processes still not resolvable**

⇒ Can be treated as stochastic process in data assimilation

Example : dust lifting by turbulent winds and very local winds

- **Unknown boundary conditions driving atmospheric processes**

Example: dust lifting not predictable because dust availability not known