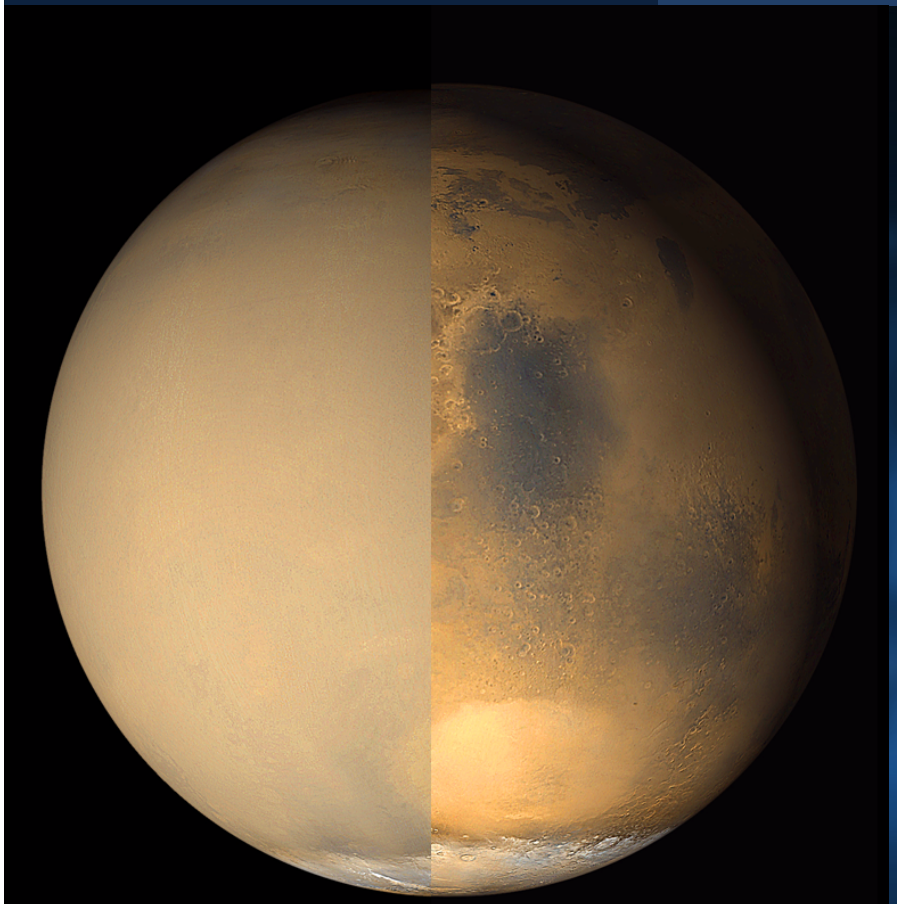
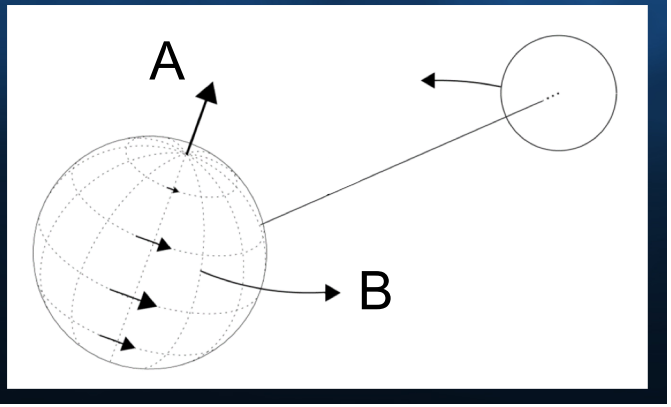
# A Breakthrough in Weather and Climate Prediction for Mars



*Mars before (right) and during (left) the global dust storm of 2001*

**A new model is able to predict with remarkable accuracy which years global dust storms will occur on Mars.**

- Spectacular global dust storms (GDS) occur on Mars in only in some martian years, and previously this inter-annual variability had been unexplained.
- A new theory holds that the circulation of the Martian atmosphere may periodically speed up and slow down, due to a coupling of the planetary orbital and rotational motions.
- In a recent study, an atmospheric global circulation model with interactive dust and orbit-spin coupling was able to reproduce the historic climate record of Mars years, with and without GDS, with success rate of 77% (showing agreement in 17 of 22 years).




(Right) Axial Rotation and Orbital Revolution: A planet rotates about its axis (A), and revolves around the star as it orbits (B). Even a weak coupling of these angular momenta, contrary to the celestial-mechanical assumption of the "independence of orbital and rotational motions" has significant implications for atmospheric dynamics.

*Shirley et al., (2019) Icarus*