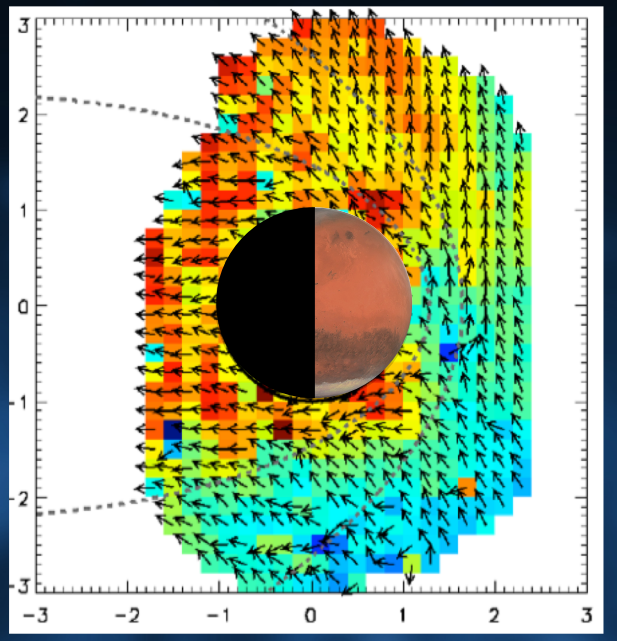
Mars Cannot Be Terraformed Using Indigenous CO_2

A new study of carbon budgets on Mars suggests that too much has been lost to space for CO_2 to be the major greenhouse gas to terraform the planet.

- A long standing question asks whether the climate of Mars could be altered to raise atmospheric pressure to allow people to work on the surface without spacesuits, or to have temperatures warm enough for liquid water?



Right: MAVEN observations of O^+ ions being stripped away to space by the solar wind. Loss of gas to space has been a major process for atmospheric change on Mars

Left: HiRISE and CRISM images showing carbonate rocks (in green) in the Nili Fossae region of Mars. Carbonates are rare, consistent with most CO_2 having been lost to space.

Jakosky and Edwards (2018), Nature Astronomy

- To do this with indigenous resources would require subsurface reservoirs for CO_2 (a strong greenhouse gas) to be identified and mobilized back into the atmosphere.
- An inventory of available CO_2, based on MAVEN and MRO data, indicates that most of the CO_2 has been lost; the remaining CO_2 would be difficult to mobilize and emplace into the atmosphere.
- It is not possible to “terraform” Mars using presently available technology; these efforts would require developing a future capability to manufacture high-efficiency greenhouse gases.