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OMEGA

Water ? Water !

(but not quite as envisioned before)

• OMEGA shows no evidence for permanent oceans or lakes along the past 3 billion years. No extended areas with carbonates, that would constitute the trap of the early CO$_2$ dense atmosphere. Mars likely suffered a very efficient and early atmospheric loss, with no long-term green-house effect. This is a major departure from the Earth evolutionary pathway.

• Water is today predominantly present as ice, with the two polar caps constituting massive reservoirs, and within hydrated minerals.

• In the early times, large water episodes led to the formation of clays, identified by OMEGA in the ancient cratered terrains.
More importantly, OMEGA has identified and mapped a variety of deposits, constituted of hydrated sulfates, which trace back water-driven processes, in three major locations:

→ within Valles Marineris, in bright and stratified (layered) deposits

→ close to the Opportunity landing site

→ at the North pole, where the dark dunes are made of gypsum!
H$_2$O ice

CO$_2$ ice

Permanent southern polar cap
OMEGA composition / HRSC imaging

Hydrated layers

kieserite

OMEGA maps, © IAS

HRSC images by courtesy of G. Neukum
A wide polar area made of gypsum

OMEGA maps, © IAS
The OMEGA observations tell that before Mars entered a dry and cold era some 3 billion years ago, Mars could have hosted warm and wet episodes in its early history.

This phase is traced back by the sulfate-rich areas mapped by OMEGA, that should constitute targets for future NASA and ESA in situ explorations.