

Mars Special Regions Activity Update

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Mars Special Regions

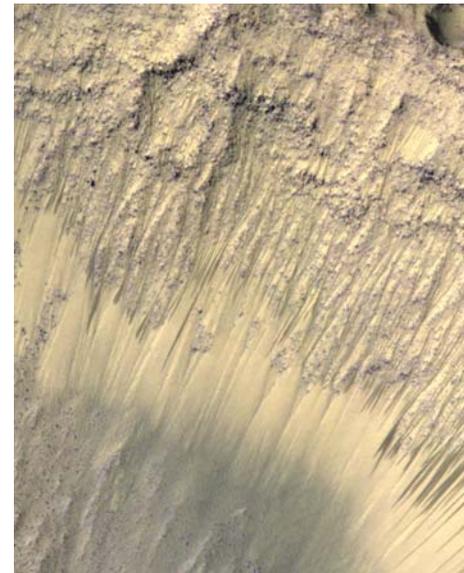


Definition: A Special Region is defined as a region within which terrestrial organisms are likely to replicate. Any region which is interpreted to have a high potential for the existence of extant martian life forms is also defined as a Special Region

Given current understanding of terrestrial organisms, Mars Special Regions are defined as areas or volumes within which sufficient water activity (≥ 0.5) AND sufficiently warm temperatures ($\geq -25^{\circ}\text{C}$) to permit replication of Earth organisms may exist

Observed features for which there is a likely association with liquid water, and which are classified as special regions

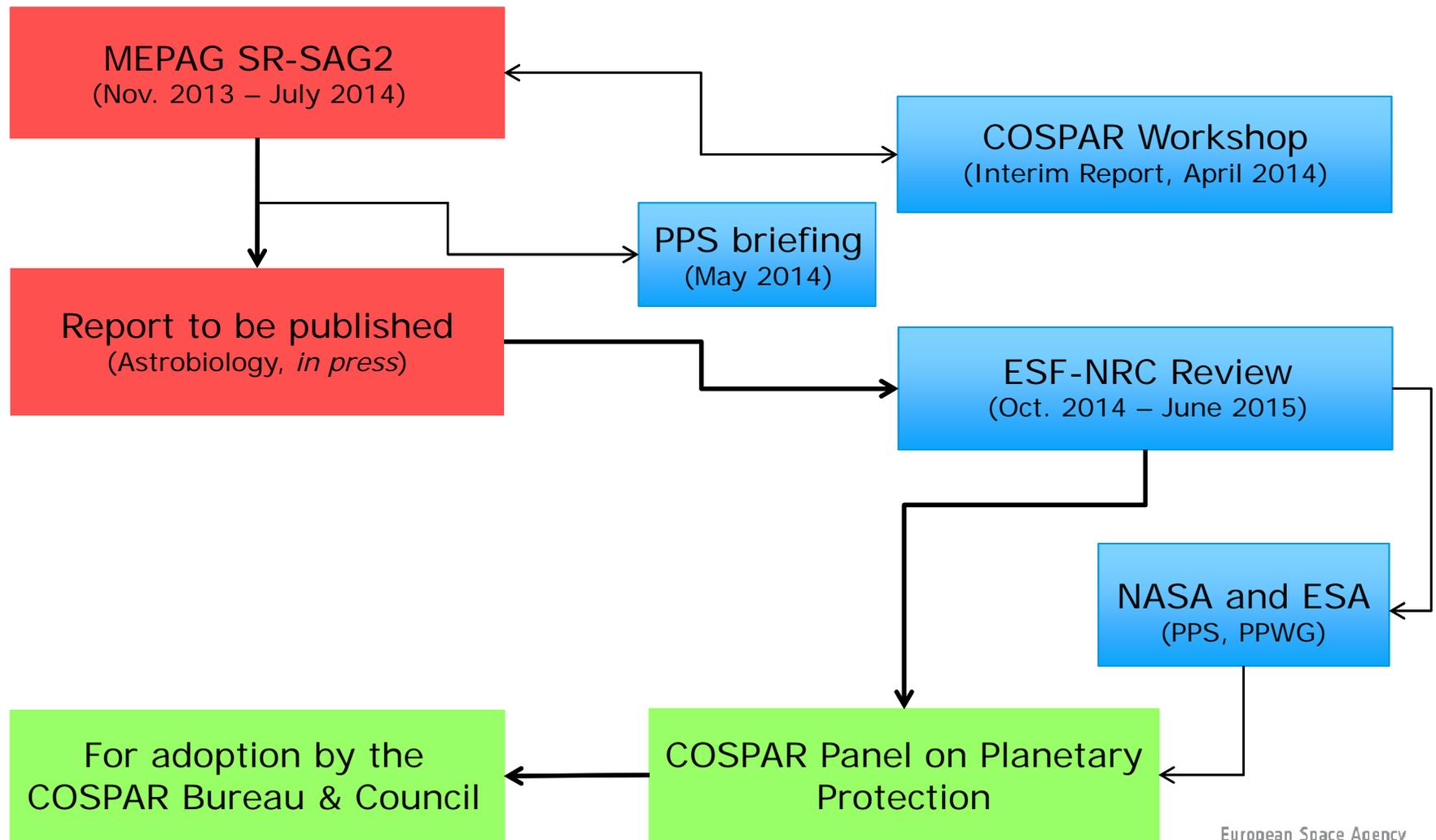
- Gullies, and bright streaks associated with gullies
- Pasted-on terrains
- Subsurface below 5 meters
- Others, to be determined, including dark streaks, possible geothermal sites, fresh craters with hydrothermal activity, modern outflow channels, or sites of recent seismic activity



McEwen *et al.* 2014

Consequence: A spacecraft landing or accessing a Mars Special Region has to meet more stringent biological contamination control

Update of Mars Special Regions



Mars Special Regions Review



- Joint ESF/ESSC-NRC/SSB committee with joint report
- Scoping meeting in October 2014, main working meeting at the German Center for Geosciences, Potsdam, in December 2014, writing meeting in the US in February 2015

Input:

- Findings of the Mars Special Regions Science Analysis Group
- Report of the COSPAR Mars Special Regions Colloquium
- COSPAR Planetary Protection Policy
- Report of the MEPAG SR-SAG2

Scope of work:

- Review of the current planetary protection requirements for Mars Special Regions and their proposed revision
- Detailed assessment, in particular of any changes proposed

Expected output:

- Joint report describing the conclusions of the review, including the wording for a proposed update of the current planetary protection requirements for Mars Special Regions
- Presentation to the NASA Planetary Protection Subcommittee (PPS) and the ESA Planetary Protection Working Group (PPWG)

Back-Up



MEPAG SR-SAG2 Proposed Classification



Special	Uncertain But Treated as Special	Non-Special	Would be Special if Found to Exist on Mars
	Caves	Gullies – Taxon 1	Groundwater (at any depth)
	Gullies – Taxon 2	Polar dark dune streaks	Thermal zones
	Gullies – Taxon 3	Slope streaks	Recent craters that are still warm
	Gullies – Taxon 4		
	RSL		



Updated from current definition

Gullies – Taxon 1: Gullies forming today at CO₂ frost point

Gullies – Taxon 2: Geologically very recent gullies in relatively warm locations spatially associated with ice

Gullies – Taxon 3: Geologically very recent gullies NOT spatially associated with ice

Gullies – Taxon 4: Small gullies associated with RSL

RSL types:

Confirmed: observed simultaneous incremental growth of multiple (≥ 10) flows on a warm slope, fading, and recurrence of this sequence in multiple Mars years

Partially confirmed: observed either incremental growth or recurrence

Candidate: image shows ≥ 10 slope lineae that resemble RSL but lack of observations needed for partial confirmation

“More importantly, the surprising abundance of apparent water near Mars' equator should renew interest in the search for extant life. Although steep slopes with RSL cover a very small fraction of Mars' surface (<0.1%), there may be shallow water hidden from view over more substantial regions.”

McEwen *et al*, Nature Geoscience 7, 53-58, 2014

One of the identified knowledge gaps



Finding 4-12: Environmental conditions at the Phoenix site, both at the surface (measured) and in the regolith (modeled) are incompatible with cell division. Note, however, that both sufficient water activity (as a vapor) and warmer temperatures may be present in the summer within the same 24-hour cycle, but never simultaneously.

