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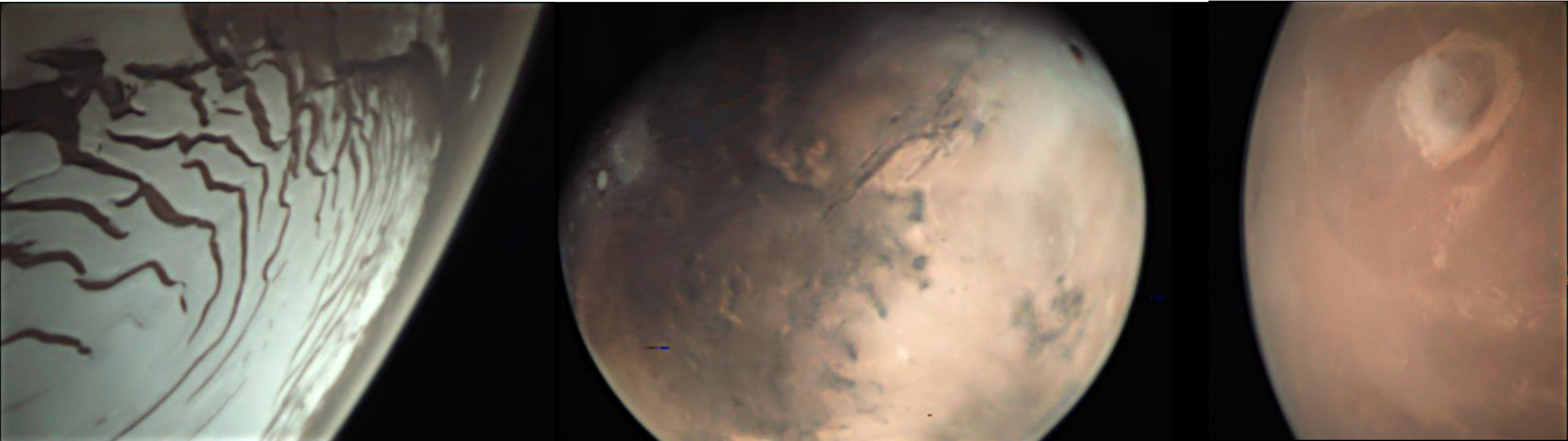
The Webcam around Mars: Supporting Science with the Mars Express Visual Monitoring Camera

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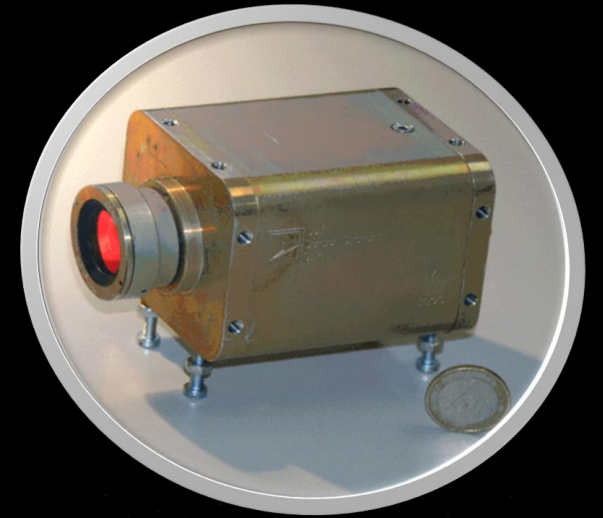
What is the *Visual Monitoring Camera*?

VMC was originally an engineering camera designed to **monitor the release of the Beagle-2 lander** from Mars Express.

In 2007, VMC was switched back on again for outreach purposes. After VMC was successfully used for the **analysis of limb clouds*** it was **'upgraded'** to the status of a scientific instrument in 2016.

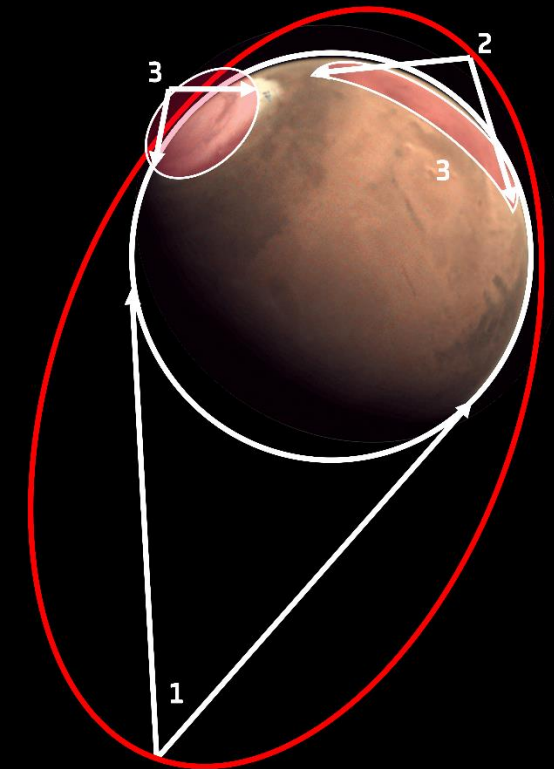
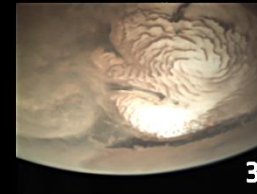
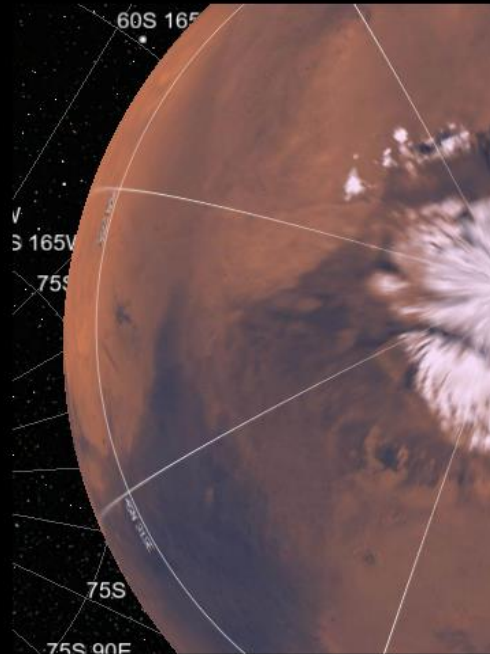
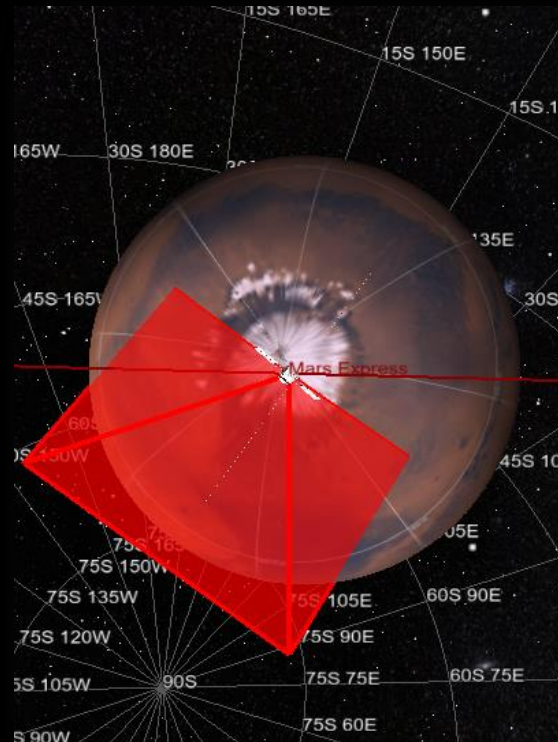
The VMC is a small 640 x 480 pixel camera with a **wide field of view of $\sim 40 \times 31^\circ$** . The wide field of view of VMC is important because it allows VMC to capture the entirety of Mars in an image, allowing scientists to investigate **regional and global scale atmospheric dynamic phenomena**.

**Sánchez-Lavega, A., et al. "Limb clouds and dust on Mars from images obtained by the Visual Monitoring Camera (VMC) onboard Mars Express." Icarus 299 (2018): 194-205.*

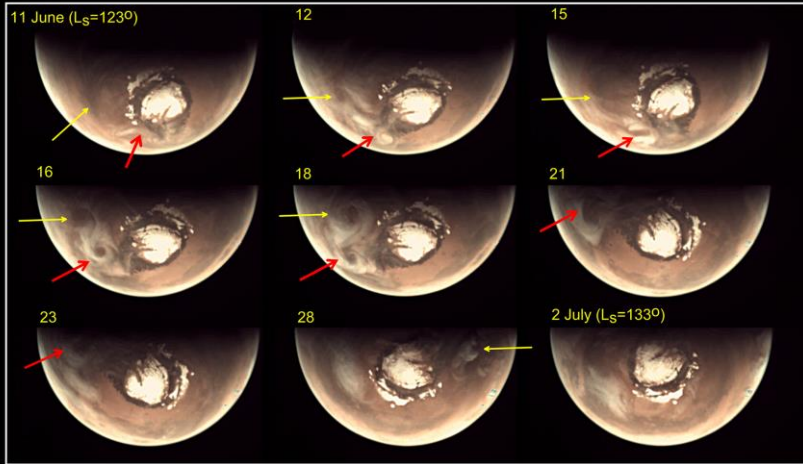


What *observations* can we take with VMC?

VMC planning is done using MAPPS (Mission Analysis and Payload Planning System) software, using the new 3D mode. The different types of VMC observations include images from apocentre which can capture the whole of Mars in the image (1), images from pericentre (2) and images capturing the limb of the planet (3). VMC cannot observe at the same time as other instruments on Mars Express.

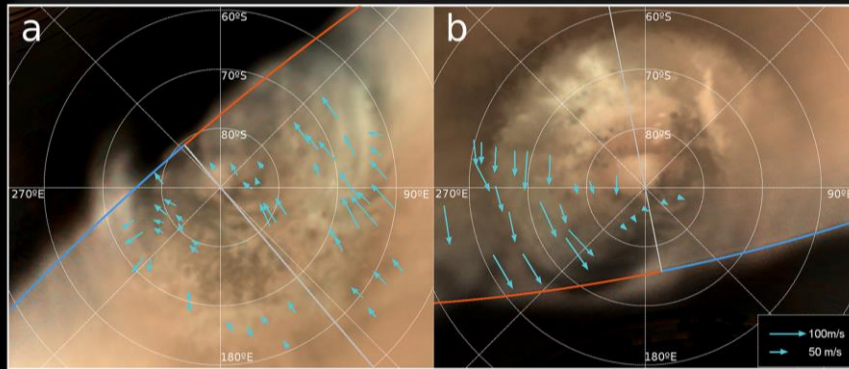


What *science* can we do with VMC data?



← Investigation of a seasonally recurrent annual cyclone with accompanying vortex- "double cyclone"- in the Northern latitudes of Mars (Sánchez-Lavega et al. 2018*).

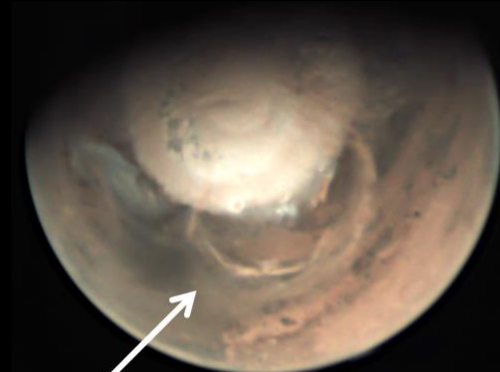
Development of the global dust storm of 2018 over the Southern polar region, Hernandez-Bernal et al. 2019**.



*Sánchez-Lavega, Augustin, et al. "A seasonally recurrent annular cyclone in Mars northern latitudes and observations of a companion vortex." *Journal of Geophysical Research: Planets* 123.11 (2018): 3020-3034.

**Hernández-Bernal, J., et al. "The 2018 Martian Global Dust Storm over the South Polar Region studied with MEx/VMC." *Geophysical Research Letters* 46.17-18 (2019): 10330-10337.

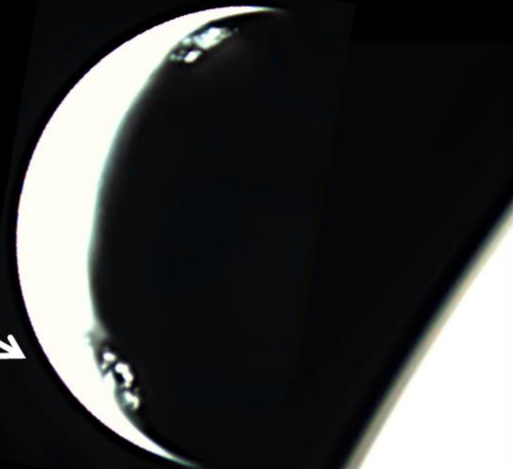
Further examples of VMC science applications



Regional and global scale dust storms



Twilight clouds



Aerosols in the martian atmosphere

“An extremely **elongated cloud** over **Arsia Mons volcano on Mars**”

The VMC science team observed an extremely **Elongated Cloud extending up to 1800 km westward from Arsia Mons** following the Global Dust Storm in Martian Year 34 (2018). A similar cloud was then found in the same season in different years in archive images of VMC.

Several other instruments have also imaged this phenomenon: HRSC and OMEGA on board Mars Express; IUVS on MAVEN; MCC on MOM; and even the Viking 2 orbiter.



Left: The Arsia Mons elongated cloud as images by HRSC onboard Mars Express. (ESA/DLR/FU Berlin)

Right: An elongated cloud over Asraeus Mons imaged by the Viking 2 orbiter. (NASA)

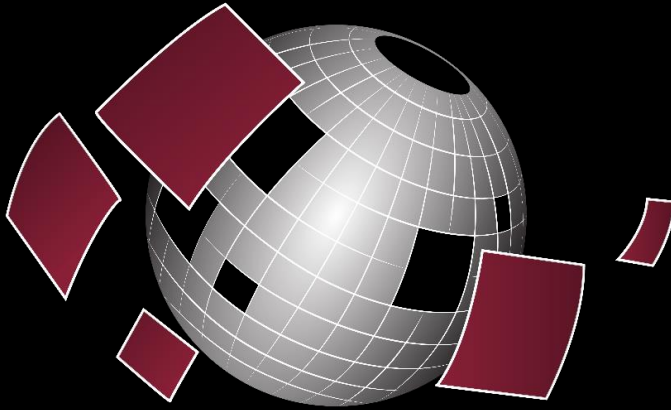
Find out more from this display:

Session PS3.6, EGU2020-433, Dynamics of the extremely elongated cloud on Mars Arsia Mons volcano. PS3.6/AS4.21/ST3.5

An elongated cloud over Arsia Mons seen by VMC onboard Mars Express on 10th October 2018. Copyright ESA//GCP/UPV/EHU Bilbao.

Hernández-Bernal et al. (2020) An Extremely Elongated Cloud over Arsia Mons Volcano on Mars: Life Cycle. Submitted to JGR.

Where can we find **VMC data**?



Planetary Science Archive

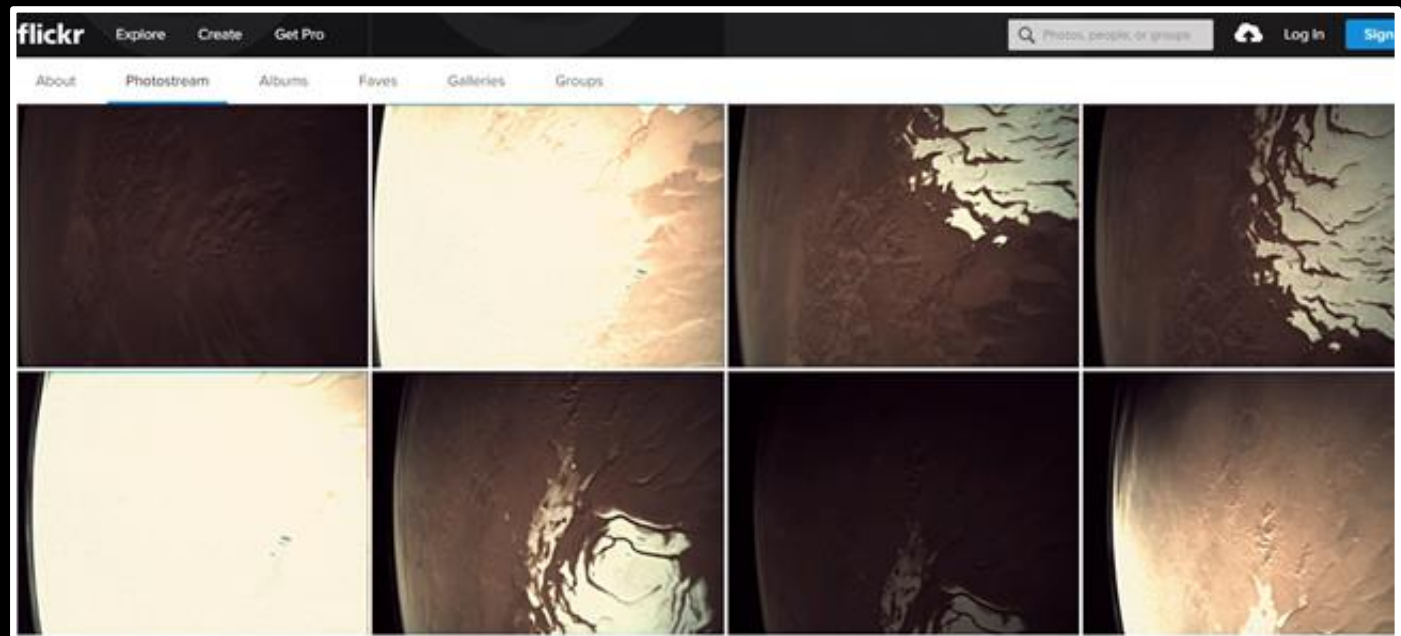
https://www.flickr.com/photos/esa_marswebcam



 @esamarswebcam

VMC data is currently in the science review stage of the archiving process, which is necessary because VMC is a 'new' instrument. All being well, **VMC data will be on the ESA PSA by the summer of this year.**

In the meantime, VMC images can be found on the VMC flickr page and on the VMC twitter account (links below).



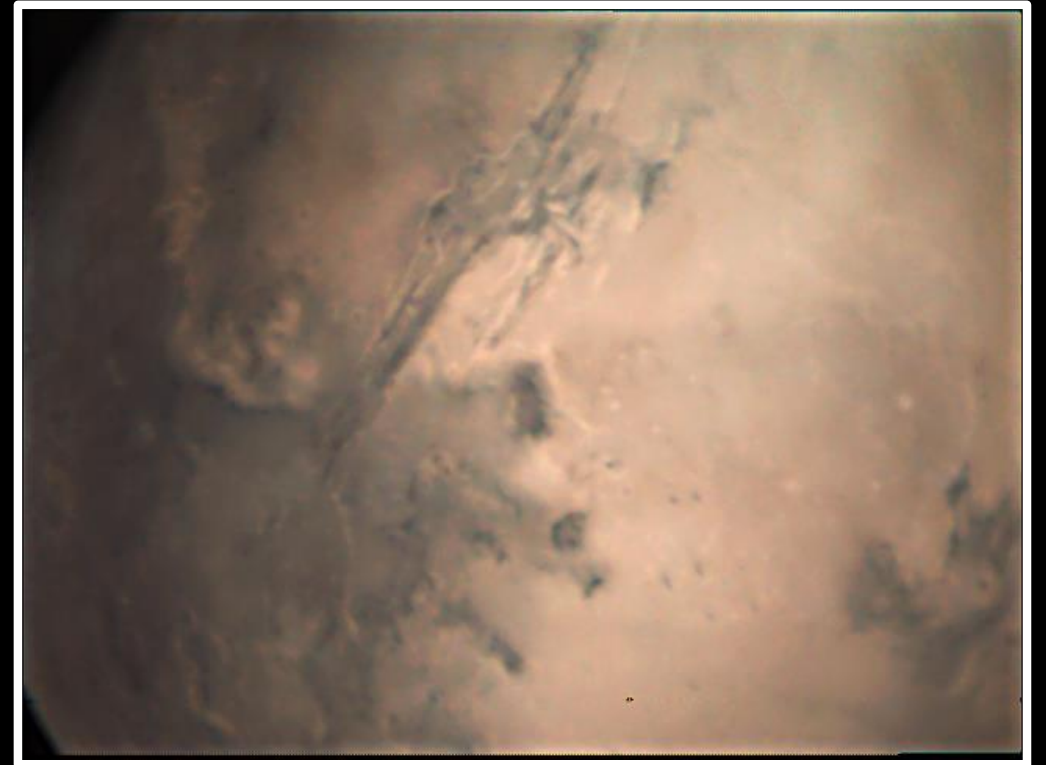
Summary

VMC was originally an engineering camera, but has now been upgraded to the status of a scientific instrument.

VMC data is currently in the science review stage, and **should be available on the Planetary Science archive in summer 2020.**

Observations from VMC have been used to analyse the 2018 global dust storm, plumes on Mars, limb clouds, twilight clouds, an elongated cloud over Arsia Mons and more.

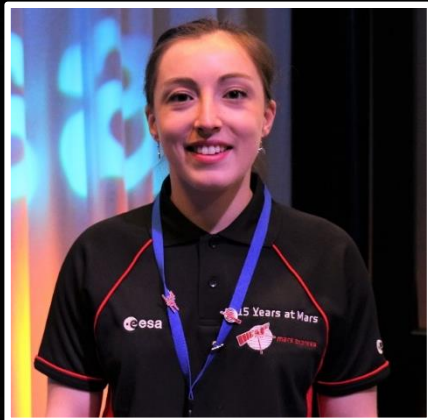
The scientific success of this “webcam” around Mars highlights how small cameras on planetary missions can yield high science return. We suggest such cameras could be included on future missions to Mars, including potential CubeSat missions.



VMC image from 2008 showing Valles Marineris. Copyright of ESA. Processed using a new pipeline at the European Space Astronomy Centre, Madrid.




Thanks for taking an interest in VMC!



If you are interested in learning more about VMC, please get in touch.

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And remember! VMC flickr: https://www.flickr.com/photos/esa_marswebcam

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