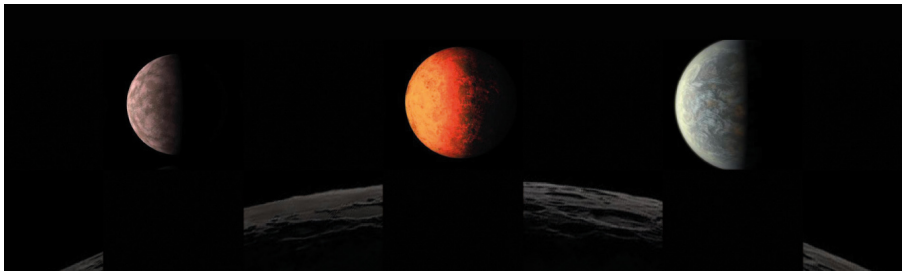

Contribution ID: **19** Type: **Poster**

A comparative analysis of dyke-assisted fracturing on Earth and Mars

Friday 24 October 2025 18:00 (1 hour)

Graben and fracture systems are prominent extensional structures found on multiple planetary bodies, though their scale, morphology, and formation mechanisms vary significantly across environments. The formation of these structures is closely linked to magma dyke emplacement and lithospheric flexure in regions such as Cerberus Fossae on Mars, where InSight seismic data indicate ongoing tectono-magmatic activity (1). These Martian features contrast with Earth's smaller tectonic grabens and with Lunar and Venusian analogues formed under different thermal and tectonic conditions. The study of Martian grabens and fracture systems is crucial as they not only record lithospheric deformation but also reveal potential connections between magmatism, water release, and recent tectonic activity.

A case study from the Cerberus Fossae region illustrates how graben structures cut across elevated topography and intersect older, infilled fractures, indicating successive episodes of deformation. Detailed structural mapping done using images from the Mars Reconnaissance Orbiter (MRO) Context Camera (CTX), complemented by high-resolution images from the High Resolution Imaging Science Experiment (HiRISE), provides valuable constraints on the evolution, propagation mechanisms, and potential links to dyke emplacement processes in the Martian crust.

By connecting magma propagation processes with graben morphology across different planetary bodies, this study offers insights into crustal deformation under varying gravity, thermal, and tectonic conditions. Our project aims to refine models of dyke-assisted faulting, enhance the interpretation of planetary tectonics, and evaluate how magma intrusions may influence recent Martian seismicity and hydrological events.

—

References:

Stähler et al., 2022, Nature Astronomy

Primary author: BAIJU, Amisha (Centrum Badań Kosmicznych Polskiej Akademii Nauk, Warszawa, Poland)

Co-authors: POPPE, Sam (Centrum Badań Kosmicznych Polskiej Akademii Nauk, Warszawa, Poland); CORTINOVIS, Paul (Université de Strasbourg, CNRS, Institut Terre et Environnement de Strasbourg, Strasbourg, France); MÈGE, Daniel (Centrum Badań Kosmicznych Polskiej Akademii Nauk, Warszawa, Poland)

Presenter: BAIJU, Amisha (Centrum Badań Kosmicznych Polskiej Akademii Nauk, Warszawa, Poland)

Session Classification: Poster session