AMADEE-20
GEOS Experiments

Austrian Space Forum (OeWF)

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The AMADEE-20 Mars Simulation

- **WHERE?**
  - ✓ Ramon Crater, Negev Desert, Israel

- **WHEN?**
  - ✓ 15 October -15 November 2020

- **AIMS**
  - ✓ Studying equipment behavior, e.g. robotic tools, instrument deployment
  - ✓ Testing life-detection or geoscientific techniques
  - ✓ Evolving "Know-how" on crewed planetary missions

GEOS (Geology Experiments)

- Is an internal experiment of OeWF

- Has been coordinated by the geoscientist group from RSS* team of OeWF together with RSS team lead

- Aims

  - to perform "REAL" field geology within the simulated Mars mission

  - to identify geochemical conditions

  - to enlighten the geological history of the area

  - to discover "HOW to TRANSFER" the analog mission skill set to the planetary missions

  - to find traces of life

Divided into 4 sub-experiments:

- ✓ Geo-mapping

- ✓ Geo-sampling

- ✓ Geo-compare

- ✓ Geo-micrometeorite

*RSS: Remote Science Support

Be aware of GEOs

➢ We maintain an **artificial blinding** of the geoscience team: Limited information about the test site!

➢ Analog astronauts (AAs) are **not geoscientists**

   ➢ They had approx. 3 days theoretical geo-training and 2 days field geo-training containing:

   ➢ They will have 3 more hours procedure-training before the mission during the Dress Rehearsals

Sometimes it can be a little bit complicated..!

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The **KEY** is in our hand!

Try to find a meaning for this rock piece!

HMMMM ……??!

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AMADEE-20 Geo-training

Ramon Crater

Mars

Geo-mapping

Rock-color-map

Legend

Map boundaries
- 5 x 5 km
- ⬡ Base Station

- — — tectonics
- ▬▬ Main road
- ▬▬ Road
- ···· Trail
- ···· Path
- ▬▬ Bike trail
- ▭ ROI (Region of Interest)

rock color map
1	yellow
2	beige to dark grey
3	black
3a	bright blue
4	bright beige
5	brown grey shaded
6	red
7	white
8	white beige
9	dark red
10	grey
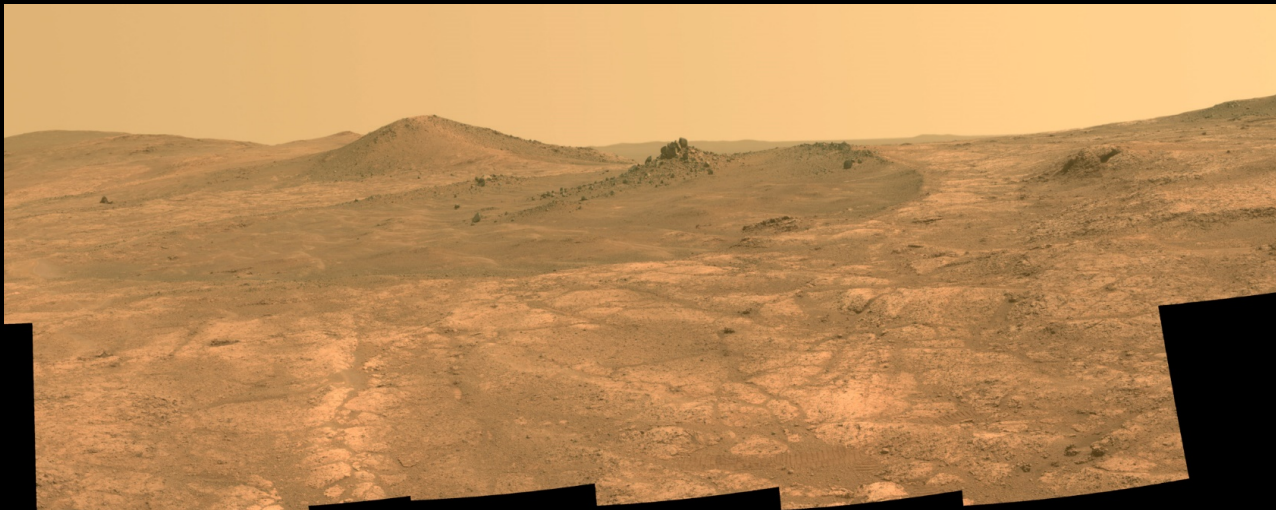
Map source: Google Maps, 2020

Legend

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Map source: Isreal government

created by Markus Eder (RSS-GEOS)

1

2
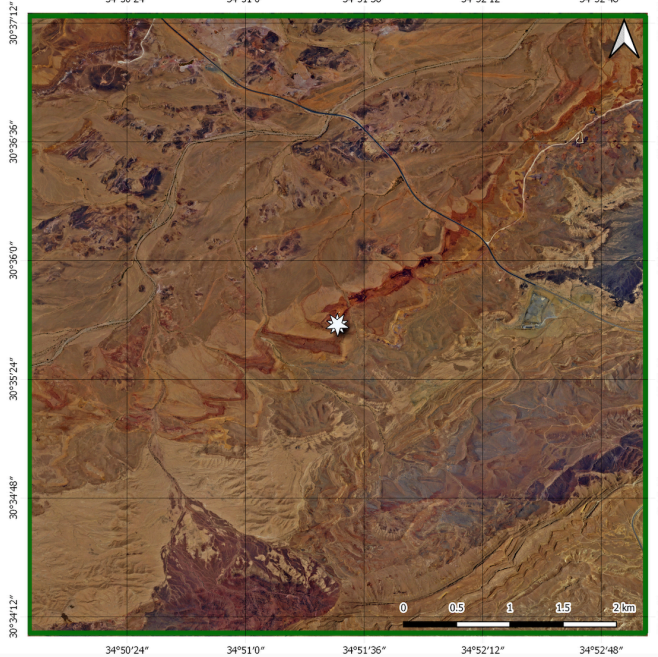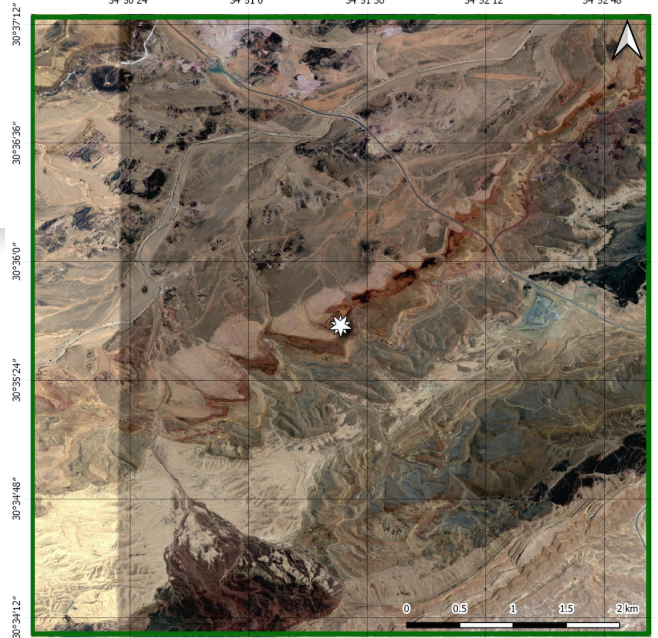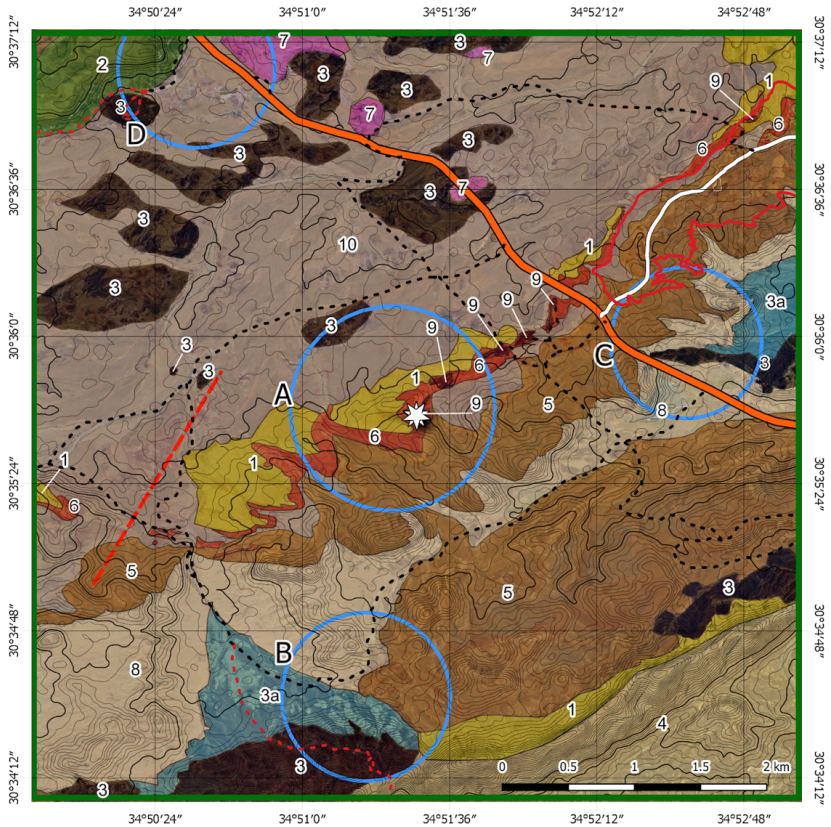
3 Pre-mission

Post mission

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4 ?

Image Credit: OeWF

Geo-mapping

Pre-mission phase
- ✓ Worked on satellite images
- ✓ Defined 10 different formations (1-10) ca. 5 km around the base station
- ✓ Defined 4 ROI (Region of Interest) (A-D)

Mission phase
- ✓ The map will be improved by AAs' field work as well as with the support of drone-rover experiments
- ✓ Major geological structures will be identified

Post-Mission phase
- ✓ Geomap with at least 4 profile sections per ROI will be finalized
- ✓ The 3D model will be produced
- ✓ The map produced by AAs and a geologist will be compared
- ✓ Lessons learned

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Rock-color-map

Legend

Map boundaries
- ▭ 5 x 5 km
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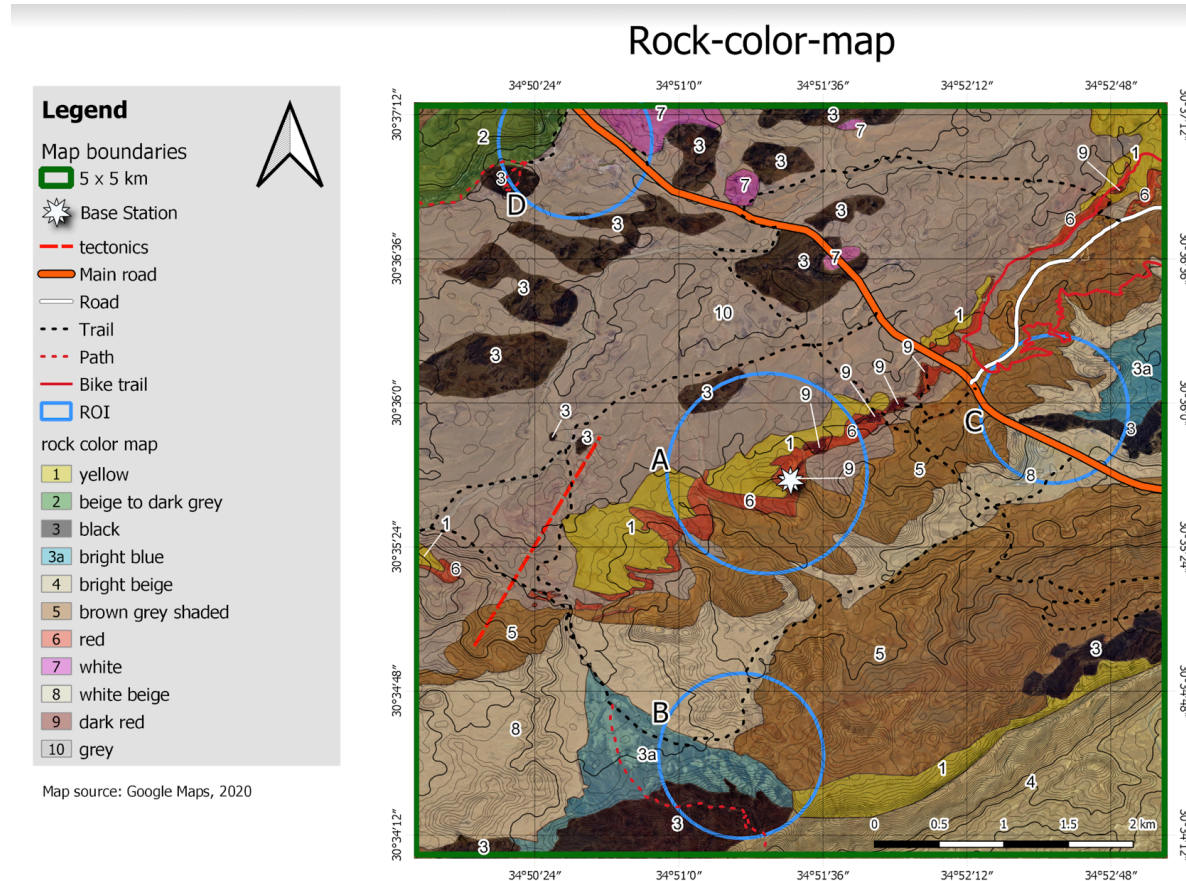- 9 dark red
- 10 grey

Map source: Google Maps, 2020

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Geo-sampling

Image Credits: OeWF

AIMS

- ✓ The samples speak for the formations
- ✓ To get <u>better geological understanding</u> and the geological history of the area
- ✓ Improve the <u>AAs** usage of field work equipment</u> (e.g. hammer, sampling bags, magnet, loupe…) and define the pros and cons of the astronaut suit
- ✓ <u>Compare</u>

Pre-mission phase
- ✓ All equipment are provided
- ✓ AAs were trained in geo-sampling methods and procedures

Mission phase
- ✓ Each POI* is a sampling location which will be handed to AAs by PIs after drone and rover missions during bridge head phase
- ✓ Representative samples will be collected according to procedures
- ✓ required pre-lab will be performed at the base

Post-mission phase
- ✓ Suitable samples will be picked by PIs and will be sent to respective laboratories for petrographic and geochemical investigations

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*Point of Interest
**Analog Astronauts

Micrometeorite

Image Credits: Jon Larsen

Pre-mission phase
- ✓ All equipment are provided
- ✓ AAs are trained on methods and procedures

Mission phase
- ✓ Each POI* is a sampling location which will be handed to AAs by PIs after drone and rover missions during bridge head phase,
- ✓ Representative samples will be collected according to procedures
- ✓ One group of samples will be taken (swiped) from: the roof and the walls of the base, drone, rover and other chosen suitable experiment tools.
- ✓ The other group of sand samples will be collected from chosen sedimentary accumulation areas
- ✓ required pre-lab methods will be performed at the base (e.g. magnetic separation, size fraction separation)

Post-mission phase
- ✓ Eliminated particles picked by the PI and will be sent to respective laboratories for petrographic and geochemical investigations

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AIMS

- ✓ Try to find traces of other planetary bodies

- ✓ Improve the AAs** sampling skills of <u>sand and dust</u>

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*Genge M.J., Larsen J. et al. (2017). An urban collection of modern-day large micrometeorites: Evidence for variations in the extraterrestrial dust flux through the Quaternary. Geology 45 (2): 119–122.

Geo-Compare aims

- ✓ To **compare spatial information** acquisition strategies between people with different level of expertise by using thematical/geological maps and the natural environment

  - ✓ **Mobile eye tracker**

- ✓ To obtain **how to develop training skills** as well as training programs to both analog and space astronauts

Image Credit: author

VS.

Image Credit: OeWF

AMADEE-18

GEOS
Team