

## PLANETARY GEOSCIENCE RESEARCH PROJECT

### PART II – IDENTIFICATION OF AN EARTH-BASED ANALOG LOCATION

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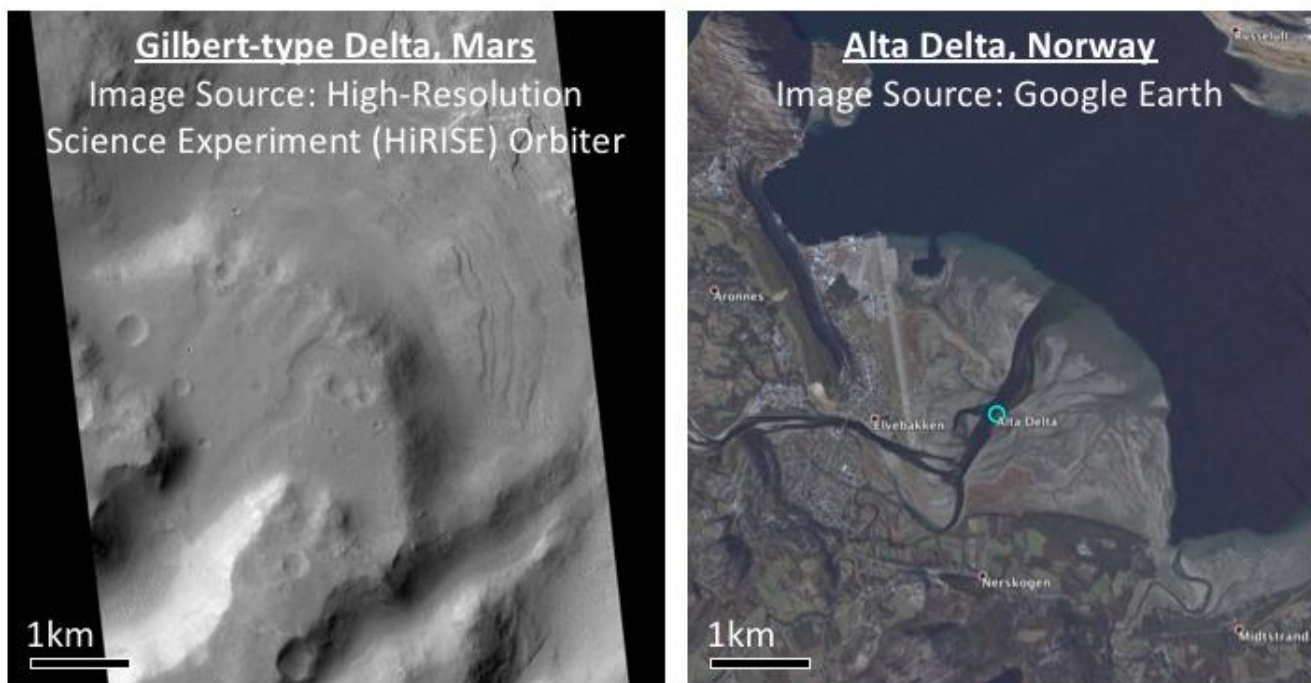
**Objective:** One of the major components of your grade in this course is an independent research project on the topic of **terrestrial analogs**. A terrestrial analog is an earth-based location that is used to study phenomena observed on other planets, moons, or rocky bodies of the solar system. The dry valley deserts of Antarctica, for example, serve as terrestrial analogs for cold, arid conditions expected on Mars. Likewise, volcanic terrains on Earth are a natural laboratory to learn about igneous processes operating on Venus.

The purpose of this exercise is to identify a terrestrial analog for a process operating on a rocky solar system body, i.e. your 'target'. At the end of this exercise, you should be able to:

- Describe a geological process operating on a rocky solar system body
- Think critically about the conditions necessary for that process to operate
- Identify locations on Earth where that process may be operating

**Note that no earth analog will be a perfect match to processes operating on another solar system object. The objective here is to characterize how geologic processes on two bodies (the Earth and a target) will be similar and how they will differ.**

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Sample of a terrestrial analog study comparing deltas on Earth and Mars. The delta on the left is captured in a High-Resolution Science Experiment (HiRISE) image on Mars. The morphology is fan-shaped and drops off steeply from a plateau onto a slope. The earth-based analog location is a fjord-head delta in Alta, Norway. The morphology appears to be similar, particularly the incision of a channel into the surface of both features. However, note that the earth analog doesn't have a wide feeder channel (lower left of Mars image), nor is it flanked by canyons (bottom of Mars image). No analog is perfect!

**WORKSHEET – IDENTIFICATION OF AN EARTH-BASED ANALOG LOCATION**

**Q1.** Revisit your answers and research from Part I. In the space below, write a short paragraph of 4-5 sentences describing your target body, the mission data available for that target, and the geologic process you plan to investigate for that target. Do not discuss terrestrial analogs yet; this paragraph should focus only on the target.

**Q2.** Working in small groups, brainstorm what conditions must be necessary for this process to operate on your selected target. For example, if submarine volcanism is hypothesized on a planet, the following conditions must be met: 1) there must be a standing body of fluid (=submarine); 2) there must be sufficient heat available to generate a 'melt'; and 3) there must be a difference in density that drives fluid upward in an eruptive style. List as many conditions as your group can think of for your process in the space below.

**Q3.** Review the criteria with your group and brainstorm locations on Earth that meet as many of the listed criteria as possible. Try to list 2-4 different locations and clearly indicate which criteria they meet. It's okay if none of the locations perfectly match the criteria. The purpose of an analog is for *comparison*, and it's just as useful to identify how things differ as identifying how they are the same. Feel free to list any analogs you may have found in the literature but include 2-4 new ones that your group suggests.

**Q4.** Open Google Earth to explore the locations suggested by your group. In the space below, provide short descriptions of each location, latitude and longitude coordinates and relevant geographic information (size of feature? country and continent location?).

**Q5.** Carefully consider the proposed analog locations. Select one of these locations to read about and research using Google Scholar. Which location have you selected and why?

**Q5.** Open Google Scholar at [www.scholar.google.com](http://www.scholar.google.com). Conduct a Google Scholar search for journal articles about the geology of your terrestrial analog location. For example, “geology of volcanoes in Hawaii” or “ice sheet development on Antarctica”. These articles should be focused on *earth processes* and will likely come from geology journals rather than planetary journals.

Build an annotated bibliography of 4 references the space below. For each reference: (1) provide the citation in Chicago format; (2) read the abstract and write a 1-2 sentence description of the work; (3) download the article (if free) or request the article through TTU Interlibrary Loan (if not free) and add to your reference folder.