

**TERRESTRIAL ANALOG STUDY IN ASIA.** G. Komatsu, International Research School of Planetary Sciences, Università d'Annunzio, Viale Pindaro 42, 65127 Pescara, Italy (goro@irsps.unich.it).

**Introduction:** Asia is vast and exhibits a great variety of landscapes and environmental types. For this reason, it can offer variable geological and climatical conditions applicable as terrestrial analogs for planetary research. Indeed, the richness and diversity of geological environments in Asia have been noted as useful for interpretation of planetary geologic features [1, 2]. Nevertheless, its utilization remains still at the incipient stage.

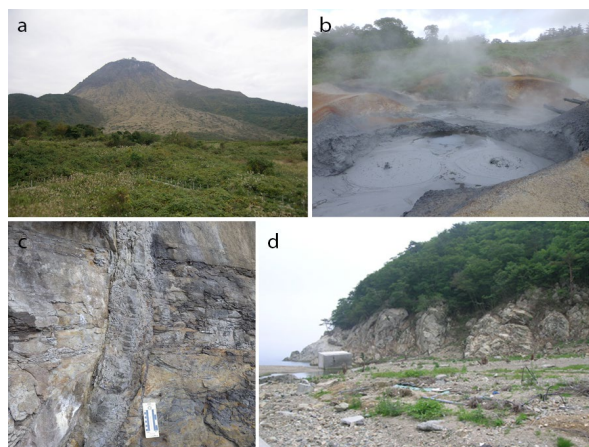
#### Examples of terrestrial analog sites in Asia:

Here, I introduce some terrestrial analog sites from Asia, most of which have been referred in planetary geology research in recent years. These are limited examples from a large number of potentially important study sites that can be explored further in the future.



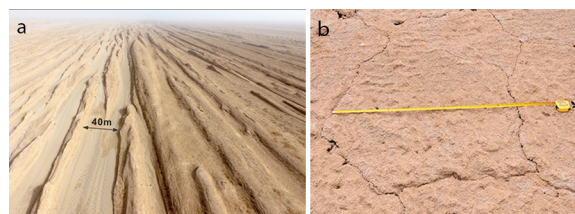
**Fig. 1.** Regions hosting the mentioned terrestrial analog sites in Asia.

**Japanese Archipelago:** The Japanese Archipelago is one of the most geologically active zones on Earth and it offers a wide range of terrestrial analog study opportunities within a relatively small territorial area. The list of such sites includes 1) volcanic landforms both magmatic (**Fig. 2a**) [3] and sedimentary (**Fig. 2b, c**) [4, 5, 6] and 2) tsunami battered areas with evidence of wave erosion and sedimentation (**Fig. 2d**) [7, 8]. In addition, hydrothermal systems are distributed all over the region and are also ideal for studying extreme environments harboring extremophiles.



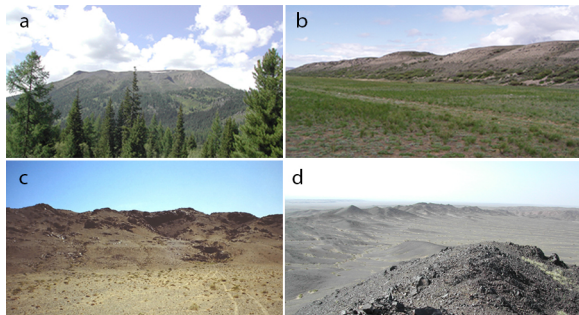
**Fig. 2.** Terrestrial analog sites in Japanese Archipelago: a) yellowish pyroclastic flow deposit at Unzen Volcano, Kyushu Island, western Japan, b) Goshogake mud volcano field, Tohoku, northeastern Japan, c) fossilized mud dike along the Kii Peninsula coast, westcentral Japan, d) valley side slope denuded by the 2011 Tohoku-oki tsunami, Tohoku, northeastern Japan.

**Tibetan Plateau:** The Tibetan Plateau has recently attracted attention in the planetary geology community because of its dry and cold environment, applicable particularly to Mars study [9, 10]. The notable examples of terrestrial analog sites are found in Qaidam Basin of the northeastern Tibetan Plateau, including yardang fields and salt-rich dry lakes (**Fig. 3a, b**) [11, 12]. Here, a long cycle history of sediment deposition, desiccation and deflation by the wind is observable and this is akin to what considered to have happened on Mars.



**Fig. 3.** Terrestrial analog sites on Tibetan Plateau: a) yardangs, b) dry lake polygon. Both are in Qaidam Basin, northeastern Tibet.

**Mongolian Highlands - Siberia:** The vast territory of Mongolian Highlands - Siberia has never been fully explored for terrestrial analog study, but the region has much to offer, in particular conditions related to ice processes [e.g., 13]. The terrestrial analog sites are 1) subglacial volcanoes (**Fig. 4a**) [14], 2) catastrophic flood features related to ice dam failure (**Fig. 4b**) [15, 16, 17], 3) paleolakes (**Fig. 4c**) [18, 19], (**Fig. 4d**) impact/volcanic craters [20, 21, 22]. Although not listed here, this region is widely recognized to host periglacial landforms such as thermal contraction (ice wedge) polygons, and they deserve investigation for planetary application.



**Fig. 4.** Terrestrial analog sites in Mongolian Highlands – Siberia: a) flat-topped subglacial volcano in Azas Plateau, southern Siberia, b) side-view of gravel dunes along upper Yenisei River, Tuva, c) terraced paleo-shorelines in Valley of Lakes, southern Mongolia, d) inner basin of the Tsenkher structure, southern Mongolia.

**Indian Subcontinent:** The Indian Subcontinent is large but its potential for terrestrial analog study has not been exploited sufficiently. One exception is Lonar impact crater located on the basaltic Deccan Traps (**Fig. 5**) [23, 24, 25]. The value of this crater should not be underestimated since it is one of few occurring in basalt on Earth where such condition is common on planetary bodies.



**Fig. 5.** Terrestrial analog site in Indian Subcontinent: Lonar impact crater, central India.

**South Caspian Basin:** The South Caspian Basin has been receiving a great quantity of sediment by a drainage system that has been greatly fluctuating. This sediment influx contributes to formation of mud volcanoes on both land and sea floors (**Fig. 6**) [26].



**Fig. 6.** Terrestrial analog site in South Caspian Basin: mud volcanos along the western Caspian Sea coast.

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