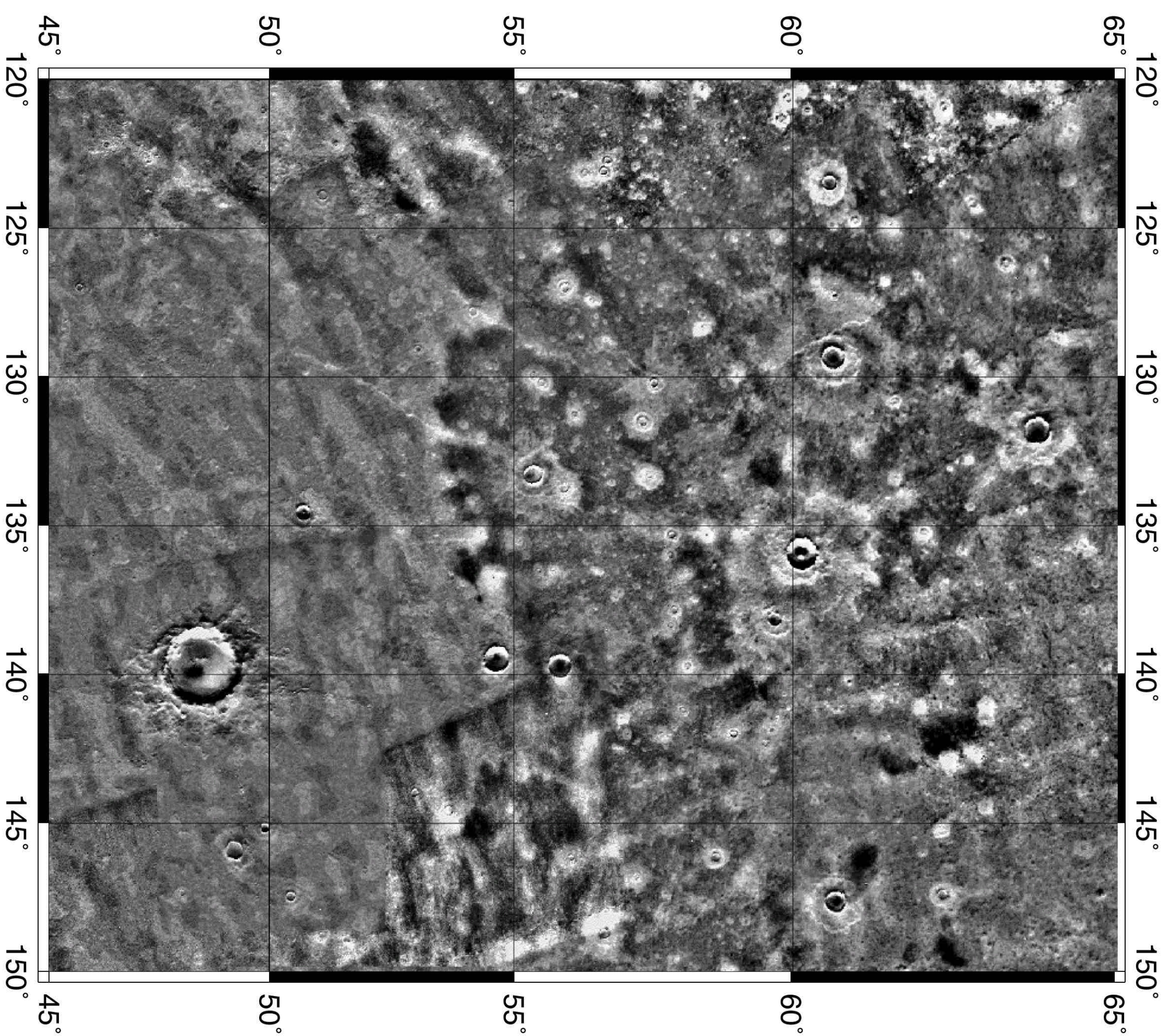
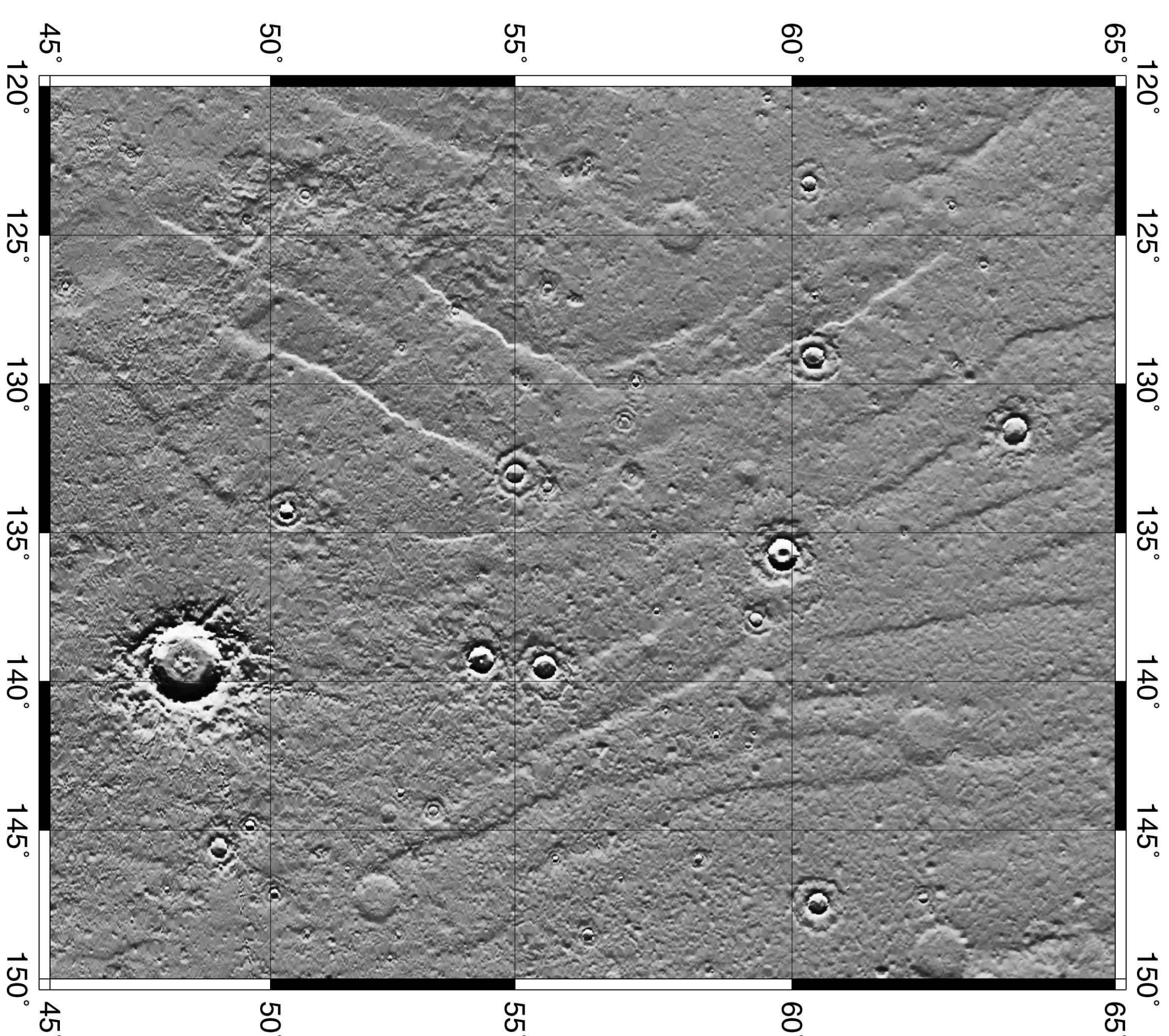


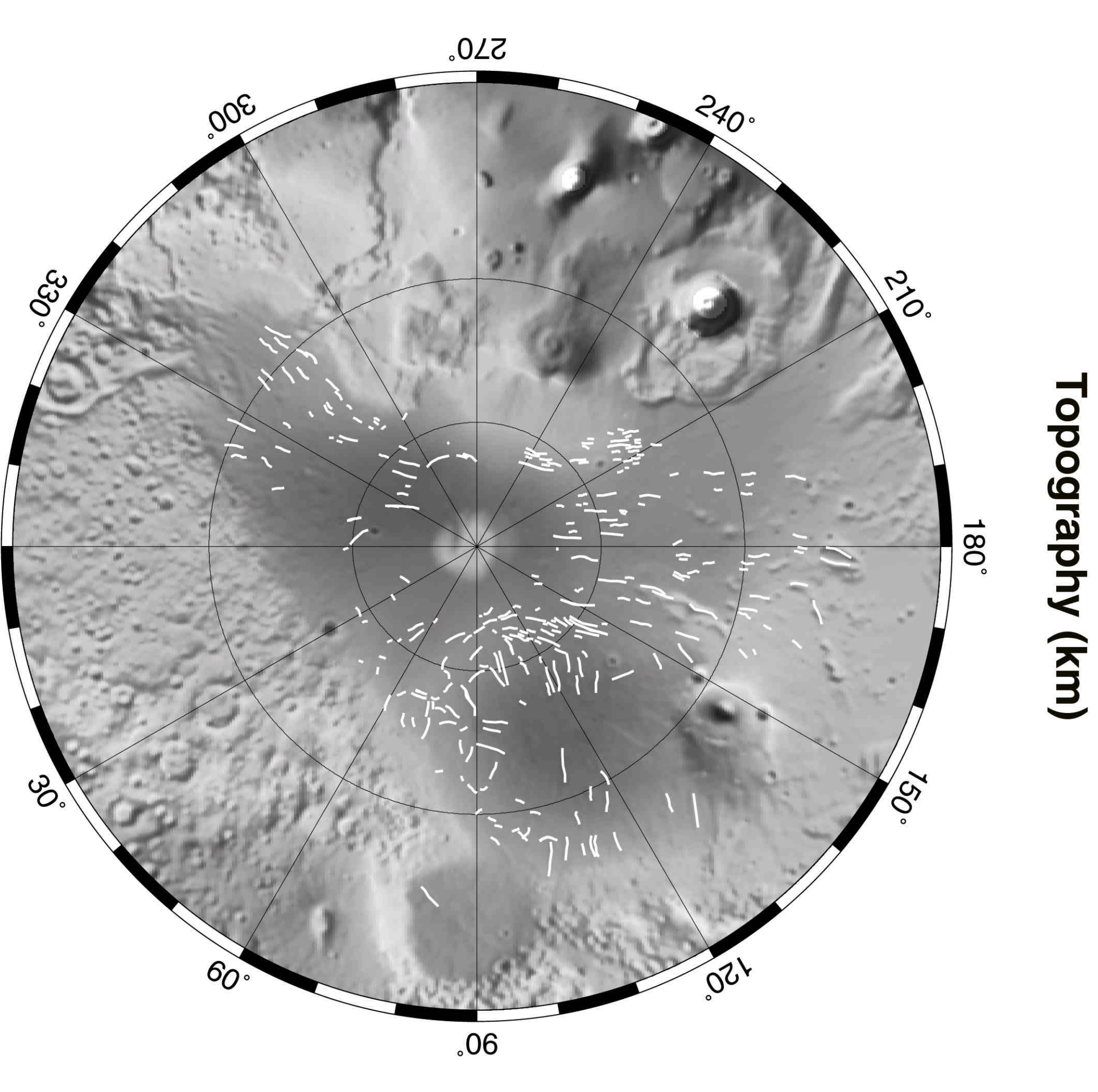
Shallow Ridges in the Martian Northern Plains



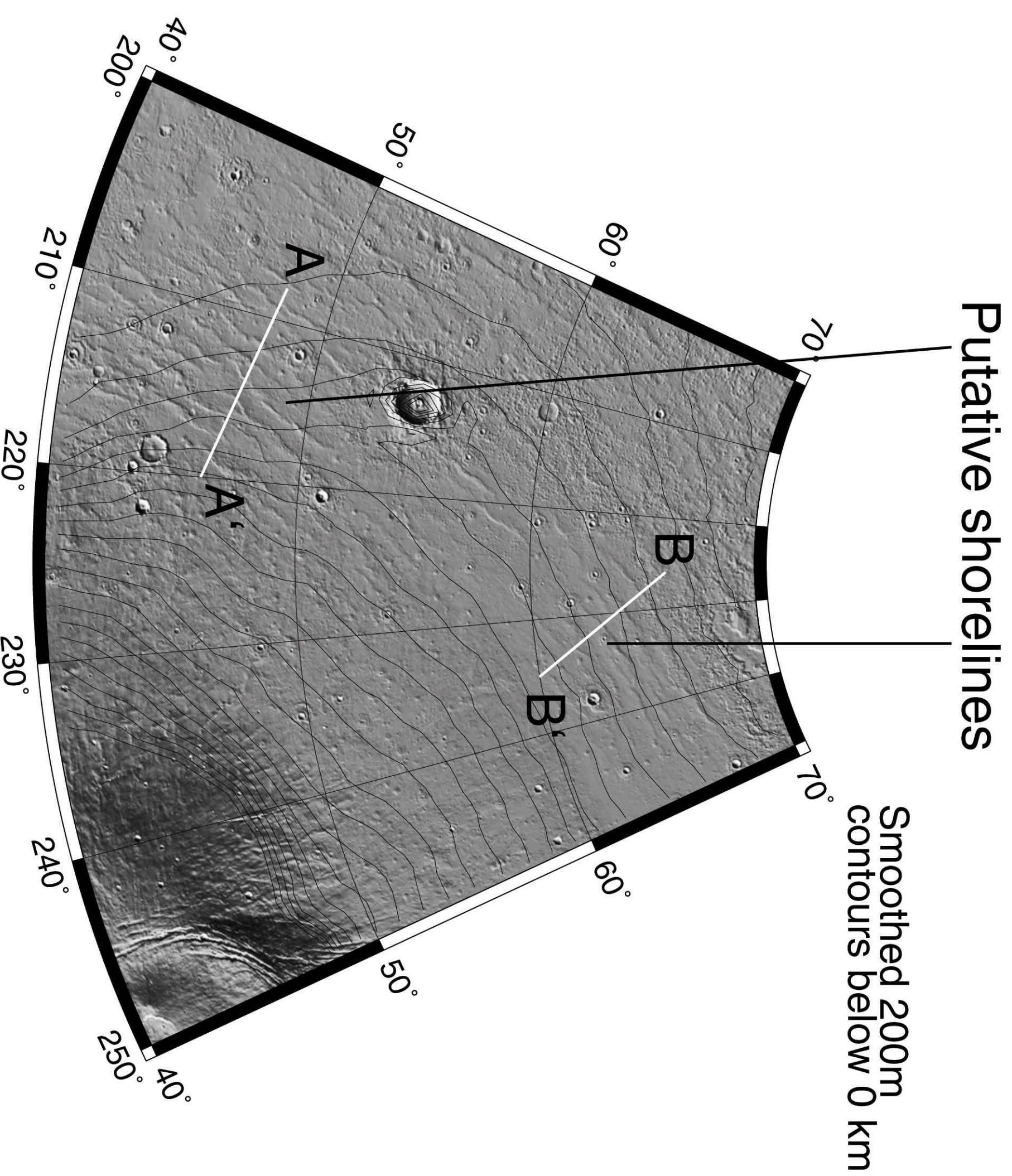
When the Viking spacecraft photographed the northern regions of Mars in the 1970s they revealed smooth, flat plains, featureless except for a few small impact craters. There are no great volcanoes, no dramatic canyons, no mountains nor valleys. Why are these plains so flat and why are the plains so devoid of geological activity? It might be that an ocean once covered this region, smoothing and flattening it by sedimentation, just like the Earth's oceans.



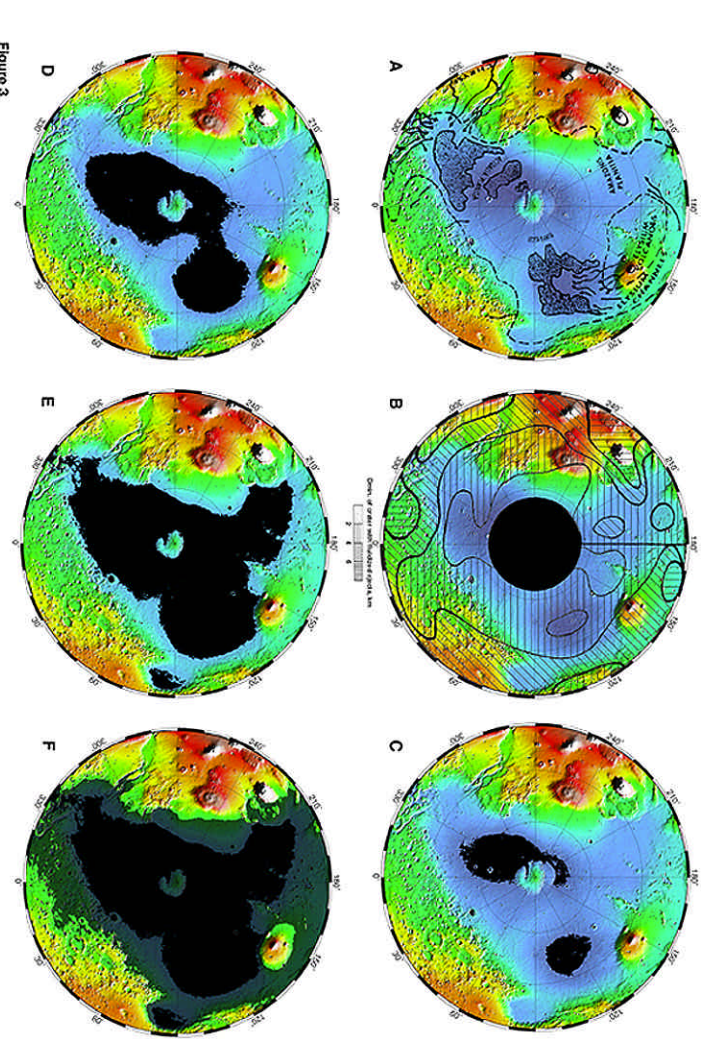
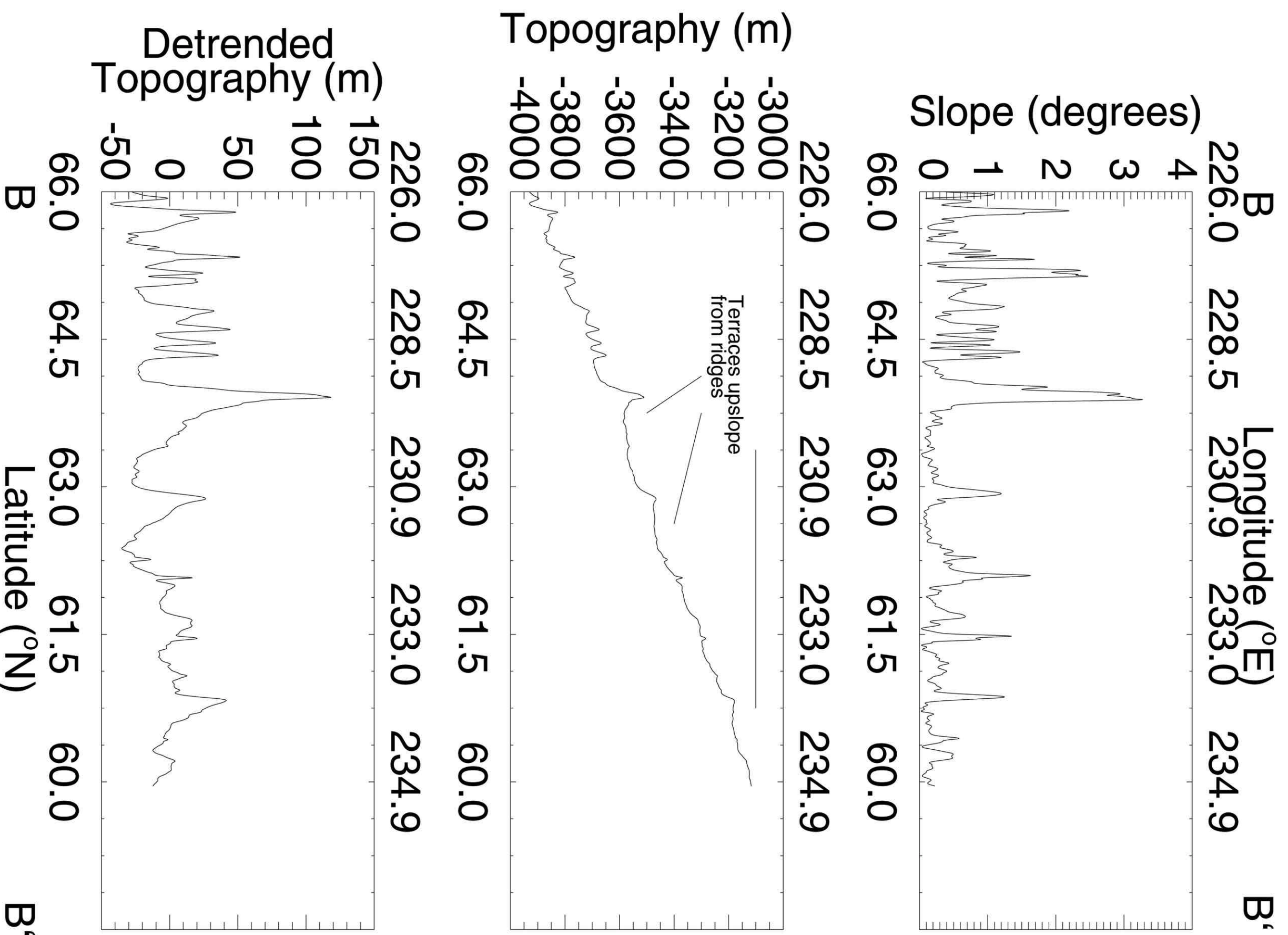
The Mars Global Surveyor spacecraft, currently in orbit around Mars, has made a very detailed map of topography on Mars. Every mountain and valley, every bump and wrinkle, has had its shape and size measured by an onboard laser to incredible accuracy. As well as the well-known craters, this map shows many new features on the northern plains. It shows a second set of craters, whose sharp edges have been smoothed in an unknown way. It also shows ridges which criss-cross the entire region.



Some of these ridges seem to lie in the right place for ancient shorelines - but not all. Many of the ridges seem to wrap around the immense Tharsis volcanoes and others encircle the large Utopia impact basin. Is this a coincidence? The weight of the volcanoes exerts forces on the martian surface over much of the planet. These forces can disrupt the martian crust and compress it to form ridges. The effects of forming a giant impact basin are similar. Is this what formed the ridges?



Close examination of the ridges shows that they are composed of a flat terrace, a sharp rise, and a steep drop to below the terrace. This terrace may be a beach. For this to be true, the sharp rise must be between the beach and the land, not the beach and the ocean. Otherwise, the sharp rise would have prevented the sea washing in and flattening out the beach. As you can see, the sharp rise is between the flat terrace and the lower ocean, so this ridge cannot be part of a beach or shoreline.



Discovery of the existence of a past ocean on Mars in the geologically recent past would be amazing. An ocean on Mars is a perfect environment for life, both simple bacteria and more complex organisms feeding on them - maybe even intelligent life. Oceans have shorelines where they meet the land. Long-gone oceans and lakes here on Earth are identified by the characteristic shapes of their beaches, long after the oceans have vanished. Might some of these ridges be the remains of martian beaches?

These ridges appear to be formed by the weight of volcanoes rather than by an ocean. Does this mean that there was no ocean? The northern plains are still extremely flat, the newly-discovered craters are still mysteriously smoothed and there is still no convincing explanation for this. An ocean may have done this - but it will be hard to tell until geologists can go there in person!