**LOIRE VALLIS: THE GRAND CANYON OF MARS.** R. Strom[1], G. Komatsu[2] and L. Nolan[1], [1]Dept. of Planetary Sciences, University of Arizona, Tucson, AZ 85721, U.S.A., rstrom@jupiter.lpl.arizona.edu, [2]International Research School of Planetary Sciences, Universita' d'Annunzio, Pescara, Italy, goro@sci.unich.it.

**Introduction:** The Loire Vallis is centered at about -20° lat.; 16° long. in the Margaritifer Sinus region of Mars and has been mapped as Noachian in age because it dissects Noachian age surfaces. However, this is only the maximum possible age since it post-dates the Noachian surface. It is about 700 km long and begins as a narrow outflow channel at a small region of chaotic terrain. The width of the channel varies from less than 1 km to about 4.5 km. However, along most of its length (~600 km) it is heavily dissected by numerous tributaries, sections of which head at escarpments similar to those at the Grand Canyon of Arizona. The width varies from about 40 to 100 km. In contrast, the Grand Canyon is about 500 km long and 20 – 70 km wide. This is similar to but slightly smaller than the Loire Vallis. The Grand Canyon is about 1.5 km deep, but we do not know the MOLA depths of the Loire Vallis at this time. We reduced the resolution of a Landsat image of the Grand Canyon to match that of the Viking images of the Loire Vallis (Figures 1 and 2). In fact, the morphology of the Loire Vallis is remarkably similar to the Grand Canyon when seen at the same resolution as the Viking images (330 m/pixel).

**Drainage density:** The length and number of tributary valleys were measured on each image to determine the drainage density and the drainage number density within the two canyons. Other studies have made similar measurements in this region [1], but they have included a much broader area that was believed to be a drainage basin. In this study, the measurements were confined to the valleys themselves for a direct comparison between the two systems. The drainage density and drainage number density of the Loire Vallis are 0.13 km/km$^2$ and 0.032 /100 km$^2$ respectively. The drainage density and drainage number density of the Grand Canyon at the same resolution (330 m/pixel) are 0.15 km/km$^2$ and 0.040 /100km$^2$. These morphometric values are very similar. The higher resolution Grand Canyon Landsat image has considerably higher drainage and number densities, but so do the three MOC images of the Loire Vallis we have examined. In fact, in at least one of these images no tributaries were mapped on the Viking image although numerous tributaries are visible on the MOC images. However, the MOC images show that the Loire Vallis is covered by a layer of dust that obscures the details of the tributary system and they cover too small an area to adequately determine the drainage density.

**Origin:** Did the Loire Vallis and the Grand Canyon form in a similar manner? Both systems show evidence of differential erosion by having resistant layers that have form escarpments at the head of some tributary systems (Figures 1 and 2). In the Grand Canyon the two most prominent layers are both limestone; the Kaibab and Red Wall formations. In the Loire Vallis these resistant layers are probably flood basalt flows overlying either less resistant lavas or possibly crater ejecta deposits or sediments. The Grand Canyon is thought to have developed its deeply dissected nature due to uplift as the Colorado river eroded downward. Whether or not this is also the case for the Loire Vallis cannot be determined until more detailed topographic information is available. In any event, the morphology of the Grand Canyon is primarily the result for water runoff and slope processes. Since the size, morphology, drainage density and number density of the dissected Loire Vallis is so similar to the Grand Canyon it is probable that water runoff (e.g., precipitation) was also important in its formation.

**References:**

[1] Grant, J.A. (1998) *LPSC XXIX*.

Figure 1. The Martian Loire Vallis. At center right side of canyon is an example of resistant layer indicating differential erosion. The width of image is about 220 km.

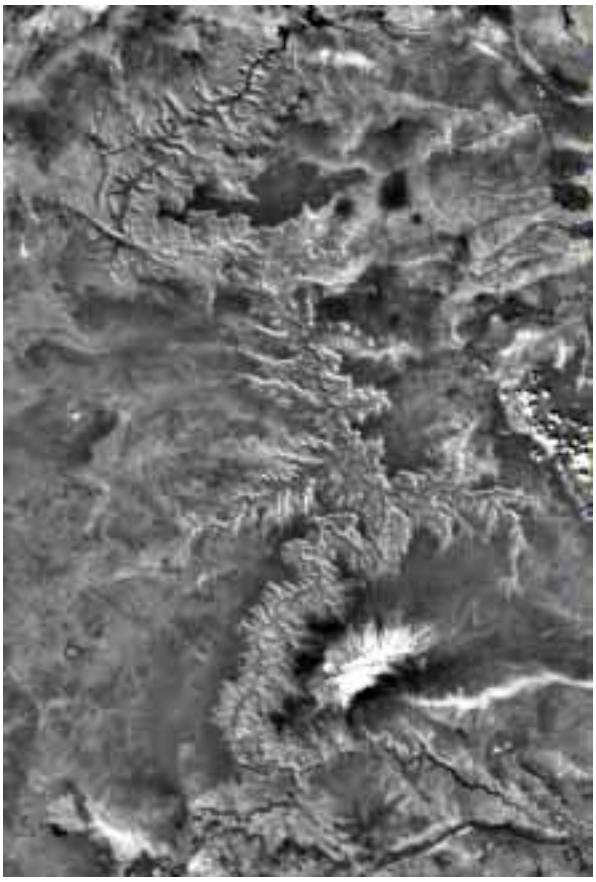

Figure 2. The Grand Canyon of Arizona at the same scale and resolution (330 m/pixel) as Figure 1. The width of image is about 220 km. North is to the right.