Introduction: Australe Planum region of the Mars planet became an interesting area for researchers after the recent discovery of large water body in Australe Planum region [1]. The objective of this study is to investigate the surface hydrology based on the drainage basins and streamline features or rivers. MOLA DEMs were used to delineate watershed using ArcGIS; and HEC-RAS was used to model the flow of water as a result of precipitation.

Hydrological Modelling: The precipitation data was hypothesized based on the area of the two basins A and B, where the recent discovered water body falls. The flow generated as a result of precipitation was assumed to be 77,851 m³/s at basin A and comparatively less 53,486 m³/s for the basin B.

Results and Discussion: The runoff model has a good fit with the streamlines generated in ArcGIS. This approach of using HEC-RAS provides a basis for surface flow. The runoff model shows that the flow velocity is high at the basin A, possibly due to high flow rate and steep slope at the upstream. The velocity downstream of basin B around the craters shows higher value which indicate the topping of water over crater boundary. The flooding can be seen downstream at both the basins which is due to the flat topography.

This study shows that the flow of water probably changed the surface topography to flat in the early wet Mars. The two continuous depression structure at the upstream, which can be interpreted as rivers, along with the run-off model and basins, is a strong argument towards the surface flow of liquid water on the early Mars.

At the present, the mean surface temperature of Mars is above the freezing point that do not lead to high precipitation [2]. The study of Earth during the presence of super-continent shows that the continental climate might be very dry at that time. So it shows that an important condition for the extensive precipitation on early mass would be the presence of large standing body of liquid water [1].

The recent study suggest a large standing water body on the Australe Planum [1]. By hypothesizing that the evaporation from this water body caused orographic precipitation, at the peak of southern pole of Mars. This study thus shows that the water surface flow of water has occurred in the Australe Planum which is confirmed by the streamline generated in the ArcGIS and the run-off model in the HEC-RAS (Figure 1).

Fig. 1. Runoff model for the two basins A and B, note that the flow starts from the water body (black triangle) according to [1].

Fig. 2. Cross-section C-C’ upstream. Vertical exaggeration in meters.

The topographic profile was generated across the upstream and downstream of the study area basins A and B. The two depressions at upstream (Figure 2) when combined with the HEC-RAS flow model (Figure 1) shows that the there are depression-like continuous structure in both Basins A and B. The 10 km lake was also discovered in the same place by [1].

This study presents the evidence from the run-off modelling and the cross-sectional profile originating from 10 km buried liquid water lake [1], in the Australe Planum region.