THREE PHASES OF LANDSCAPE EVOLUTION IN GORGONUM AND ATLANTIS BASINS, MARS. R. D. Capitan, The University of Western Ontario, 1151Richmond Street, London, Ontario, Canada, N6A 5C2, rcapitan@uwo.ca

Introduction: The evolution of landscape in Gorgonum and Atlantis basins was related to regional and planetary controlling factors [1,2]. An epoch of fluviolacustrine and subglacial activity was possible during an intense volcanic activity period in the Tharsis zone, which brought a sufficient amount of water and energy into the system[3]. The massive emplacement of the Tharsis bulge contributed to the development of Sirenum Fossae trench, longitudinal and transversal tectonic fractures. This triggered a catastrophic release of water accumulated during the previous phase and sinked the Gorgonum and Atlatis basins. After the volcanism stopped, a cold dry environment developed [4]. Water and ice accumulated at the bottom of these two basins sublimated, forming the chaotic terrain.

Observations 1. During an initial epoch of pluvial and subglacial environments, water flowed at surface or has been accumulated at surface in craters and large depressions (fig 1a). Where local conditions permitted (high relief, mosaic of bedding strata and ejecta deposits), it developed a dendritic network and debouched into transitory craters (fig 1 c). Depositional and erosional patterns formed as the climatic conditions started to change (successive alluvial channels and fans, then a subglacial delta). The accumulation of water behind Magellan's crater rim created the conditions for a catastrophic earhflow process to occur (fig 1b). Vy-MEM and nearby southeastern craters, as well as Gorgonum and Atlantis basins functioned as large paleolakes (1), transiting to paleo-ice lakes (2).

2. Due to the emplacement of the massive Tharsis bulge, radial fractures developed [5]. The formation of Sirenum Fossae and transversal tectonic fractures sunk the Gorgonum and Atlantis basins. This mechanism triggered a massive release of underground and surface water. Catastrophic release of water from Vy-MEM crater formed the outflow channels in northern Gorgonum basin. Water filled and eroded all medium sized craters from its southern area (including an unnamed pair of craters mentioned above and centered at S 33°49', W 169° 46') (fig. 2c). The major outflow channel was diverted by an ice sheet (which was previously accumulated in Gorgonum basin) toward east in Sirenum Fossae sink at S, W. As the fractures developed and marginal ice melted, water flowed under the ice along the fractures and initiated the ice sheet drift [6]. Atlantis basin sunk along marginal fracture changing the base level for the water/ice flows accumulated in the highland depression. A horst and graben structure formed, initiating the development of a tectonic-controlled network (fig 2b). Southward, a massive slide developed due to a change in surface deposits equilibrium. In southern Atlantis basin pediments formed along its borders as a consequence of rapid base level change. As the Sirenum Fossae protuded quickly into the southern Atlantis basin, the outflow channel located at S 37°54', W 174°28' was diverted toward west (fig. 2a). All the processes described for the second phase of basins evolution developed quickly as a result of a dramatic tectonic control over the landscape evolution.

3. Dry cold environment replaced the relative stable pluvial and glacial conditions in the last period of landscape evolution. A major climate change occurred when volcanism ceased. The ice accumulated at the surface sublimated. The ice-mud mixture which form the surface deposits located at the bottom of Gorgonum and Atlantis basins has been destructured by the continuous sublimation forming the irregular 'chaotic' pattern (fig 3b). Collapse, lateral sliding and thermal erosion destuctured differently the deposits depending of the amount of ice incorporated. Surface deposits bordering the basins slid gravitationally toward the basin centers (fig 3c). Later episodic surface frozen flows (a mixture of mud and underground ice released at surface by deep sublimation) formed at the bottom of previous channels. Gullying, small fan formation along crater rims, tectonic and chaotic terrain trenches, are the latest manifestations of water-related processes. Wind deflation and small impact cratering along with minor episodic gully formation form the current processes which shape the landscape (fig. 3a).

References: [1] Capitan, R. D. (2006) G. R. Abstracts, Vol. 8, 01160, 2006 SRef-ID: 1607-7962/gra/EGU06-A-01160 [2] Capitan, R. D. (2005) G. R. Abstracts Vol. 8, 01161, 2006 SRef-ID: 1607-7962/gra/EGU06-A-01161 [3] Farein,, A. G., Dohm, J.M.(2004) *Icarus, 168,* 267-284 [4] Mouginis-Mark, P.J. *et al.* (1992) in Mars, editors: Kieffer H.H. *et al* 1992 [5] Wilson, L, HeadIII, J.W (2002) JGR 107, E8 [6]Howard, A.D, Moore, J.M (2004) *JRL,vol.31*, L01702

Captions Figure 1 a. Pluvial and subglacial stage b. earthflow formation in Magellan crater.c. unnamed pair of craters affected by fluvial, subglacial and catastrophic erosion Figure 2 a.Tectonic–controlled stage. Rapid development of Sirenum Fossae and transverse fractures triggered the outflows and changed the base levels b.Horst and graben structure c. outflow outbreak into medium craters 3 a Dry and cold stage b. Chaos formation mechanism c Frozen surface flows and gravity slides of surface deposits in Atlantis basin

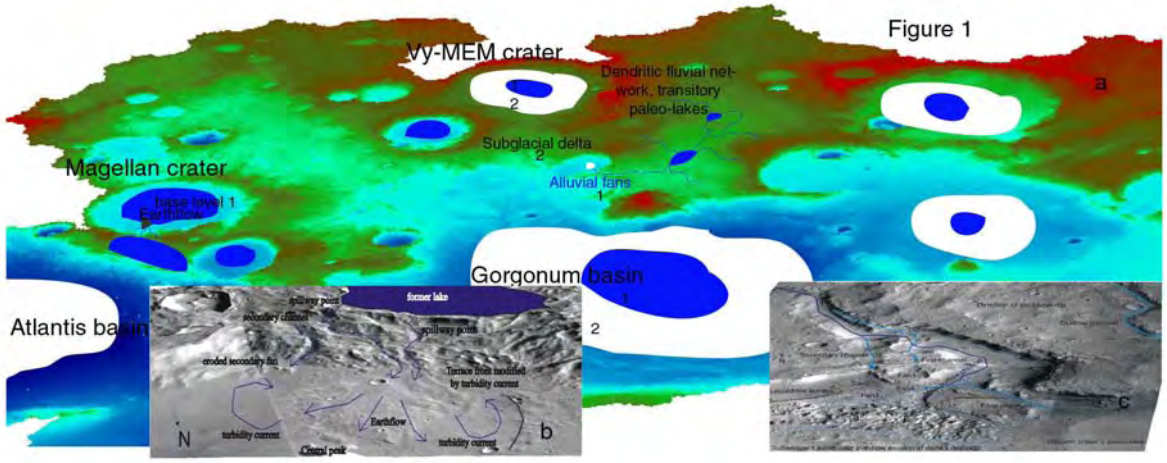
Figure 1
Vy-MEM crater
Dendritic fluvial network, transitory paleo-lakes
Subglacial delta
Alluvial fans
Magellan crater
base level 1
Earthflow
Gorgonum basin
Atlantis basin
former lake
spillway point
eroded secondary rim
Terrace from modified by turbidity current
turbidity current
Earthflow
Central peak
N
a
b
c

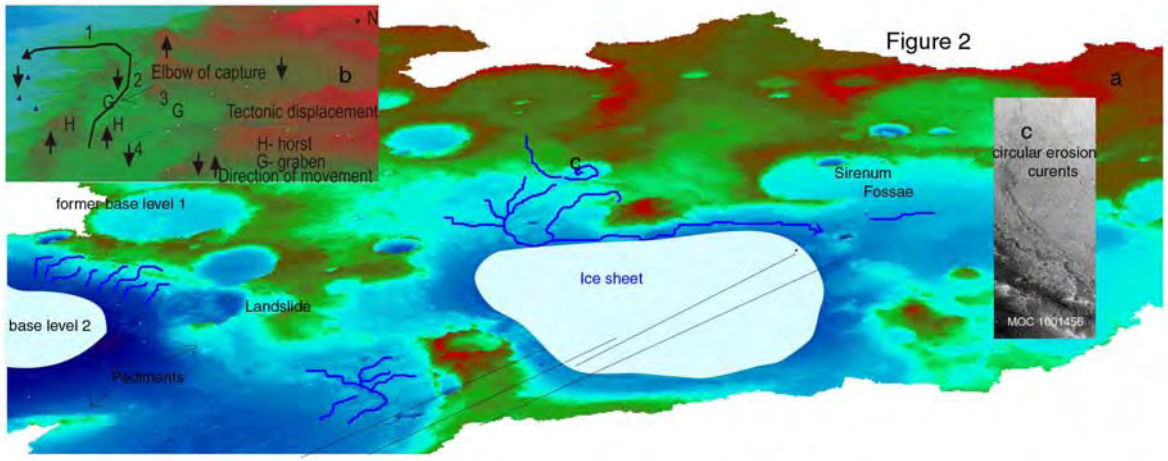
Figure 2
Elbow of capture
Tectonic displacement
H- horst
G- graben
Direction of movement
former base level 1
Sirenum Fossae
circular erosion curents
MOC 1001456
Ice sheet
Landslide
base level 2
Pediments
a
b
c

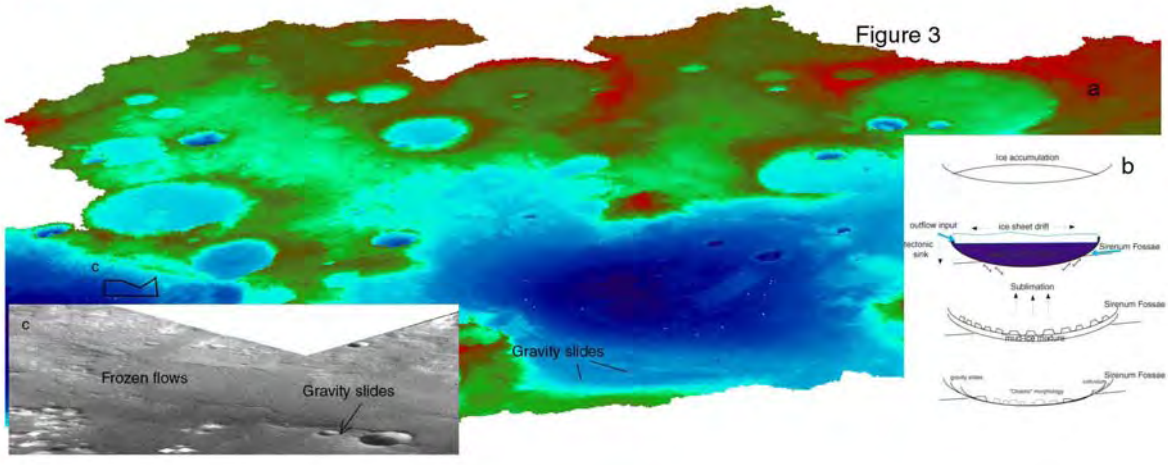
Figure 3
Frozen flows
Gravity slides
Ice accumulation
outflow input
ice sheet drift
tectonic sink
Sirenum Fossae
Sublimation
a
b
c