Section 9: Camera Tows

We completed 14 camera tows using the WHOI towed camera system. All were successful. On Tow 3, however, the camera failed to start when it reached the bottom. We brought the sled back on deck and tested it, sent it back down and it worked. On Tow 7, the camera failed to start again, and we decided to bring the sled back to the surface and swap cameras. This took about 20 minutes. Camera #004 was used for Tows 1-7a, and Camera #005 was used for Tows 7b-14. Camera #005 never failed in any of its lowerings.

The maps and profiles presented here show time and position of the ship and not the camera. As we were not sure what the layback of the camera was along the track we have not corrected for it. One way to do that would be to compare the bathymetry profile generated by the camera (depth plus altimeter) to that from SeaBeam to see if there is an obvious shift. This remains to be done.

The objective of the camera tows was to document whether flows have been erupted at the Incipient Rift since rifting initiated. We were looking for definitive evidence of lavas overlaying older sedimented terrain. A second objective was to determine whether any of the scarps of the IR gore exposed mid to lower crust such as observed at the larger Hess Deep scarps.

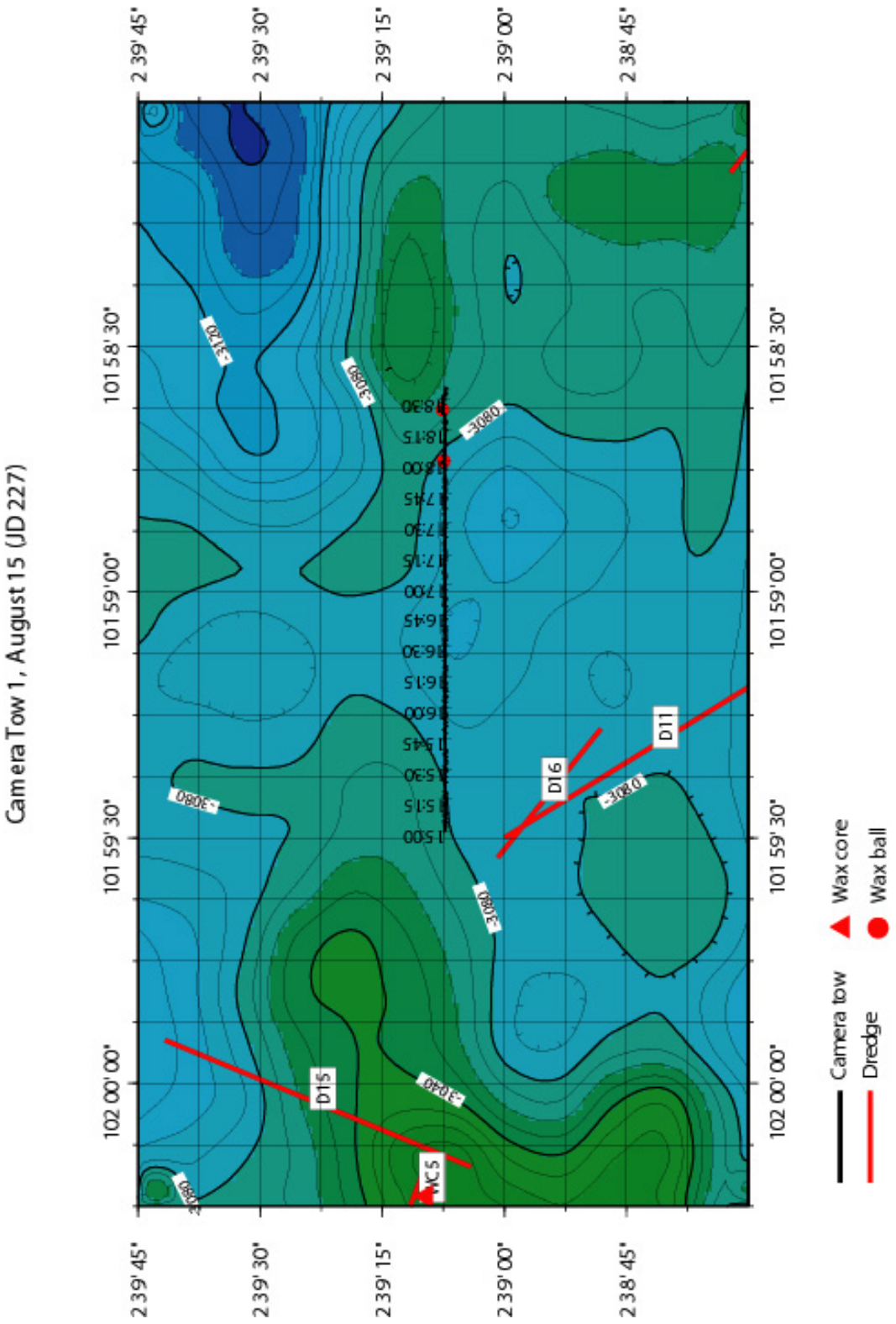
A brief description of the aims and results of each camera tow, as well as maps of the track and associated bathymetric profiles are given below.

9.1 Camera Tow 1

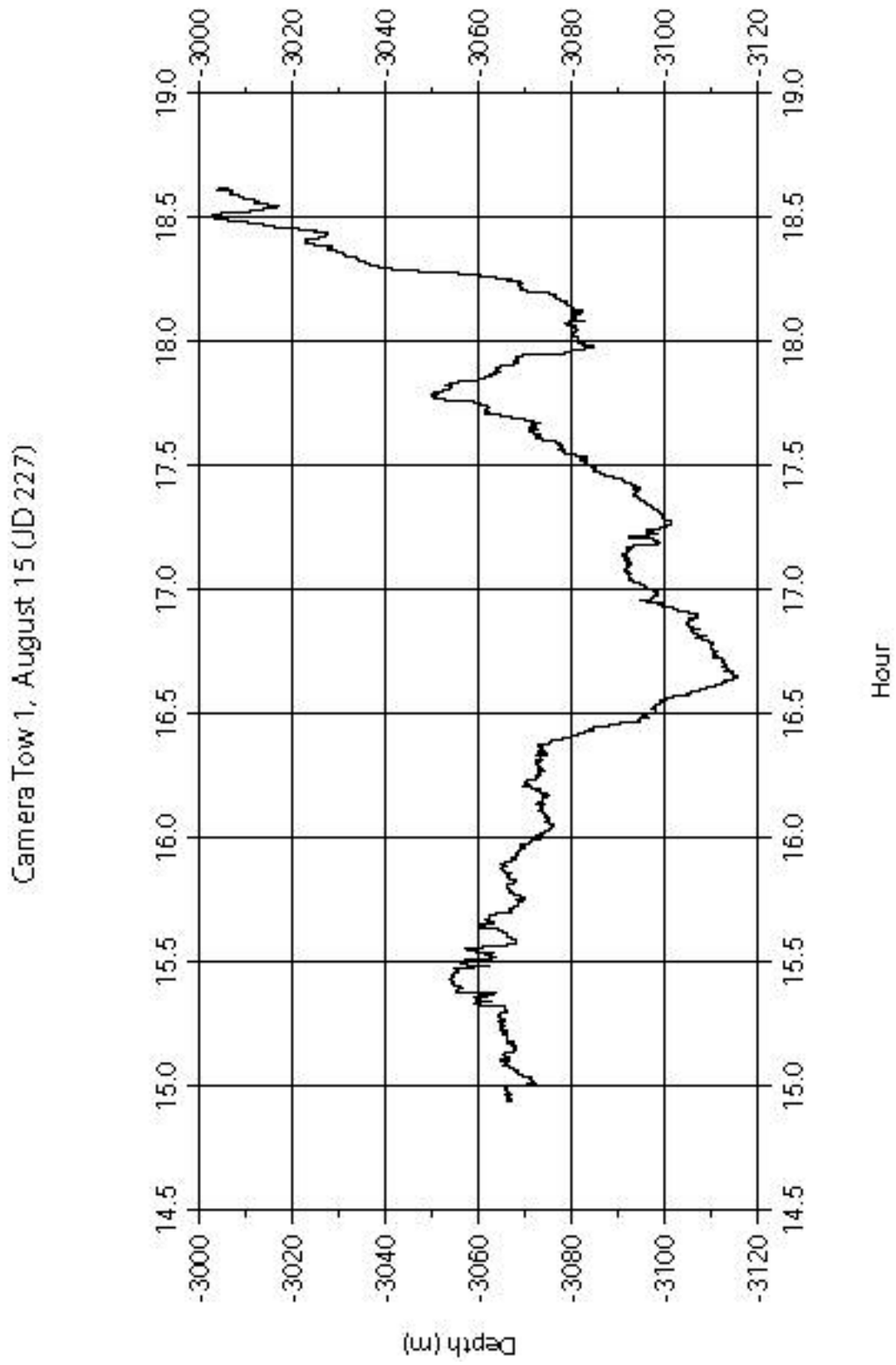
Aim: Tow 1 was a test tow to make sure that we were comfortable with how the system worked. The track was located at the tip of the magmatic gore. It was chosen to be flat based on previously collected SeaBeam bathymetry data. These older SeaBeam data, however, appeared to be slightly shifted in latitude and longitude when we later compared them to the survey that we completed at the start of the cruise. Thus the bathymetry was not as flat as we had planned for.

Results: For most of the tow we followed a scarp that was running east-west parallel to the camera tow track. In places we were on the top (north) of the scarp on sedimented lavas. In other places we moved across the scarp to the south on to rubble covered terrain.
The scarp itself was massive basalt, which we banged into a couple of times.

9.1a- CT01 Track Plot:



9.1b- CT01 Profile:

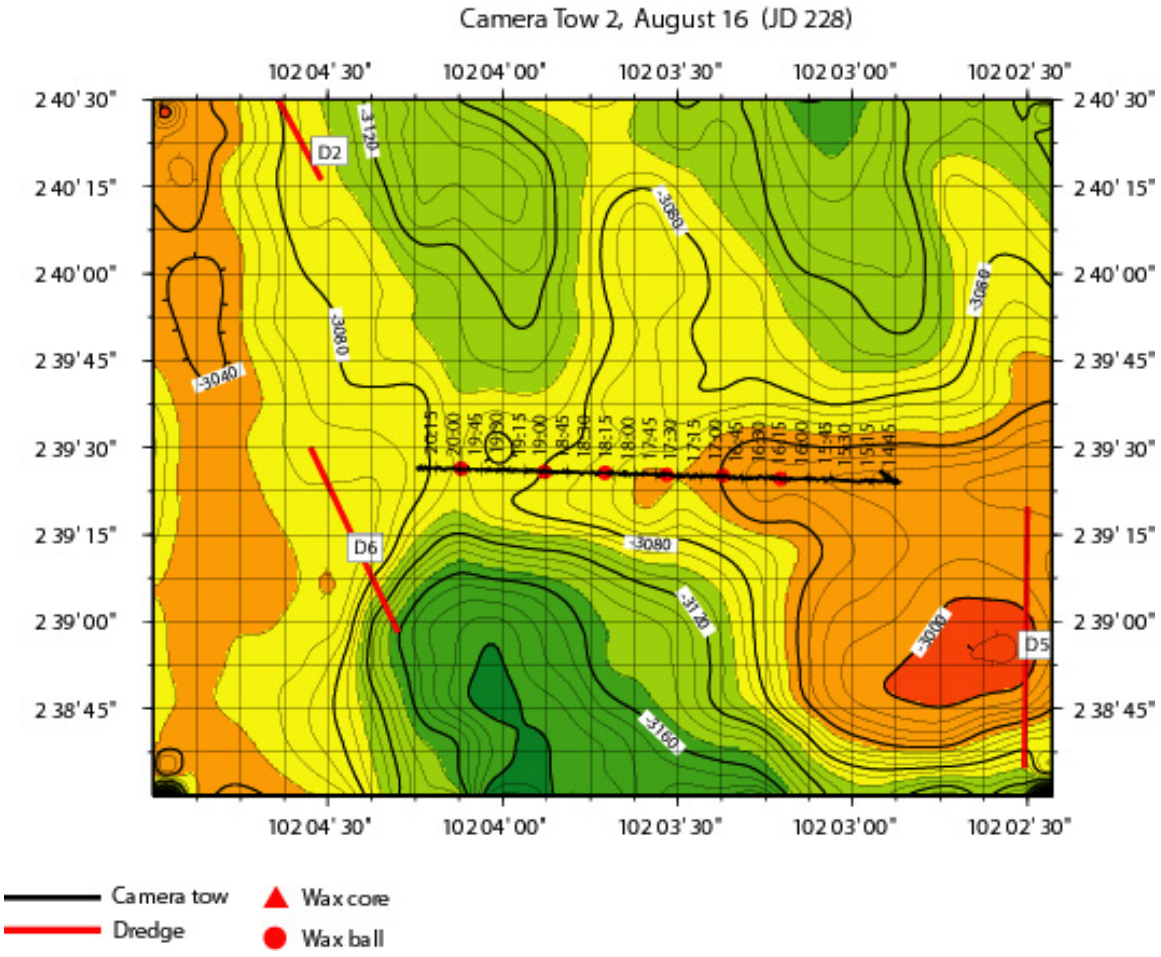


9.2: Camera Tow 2

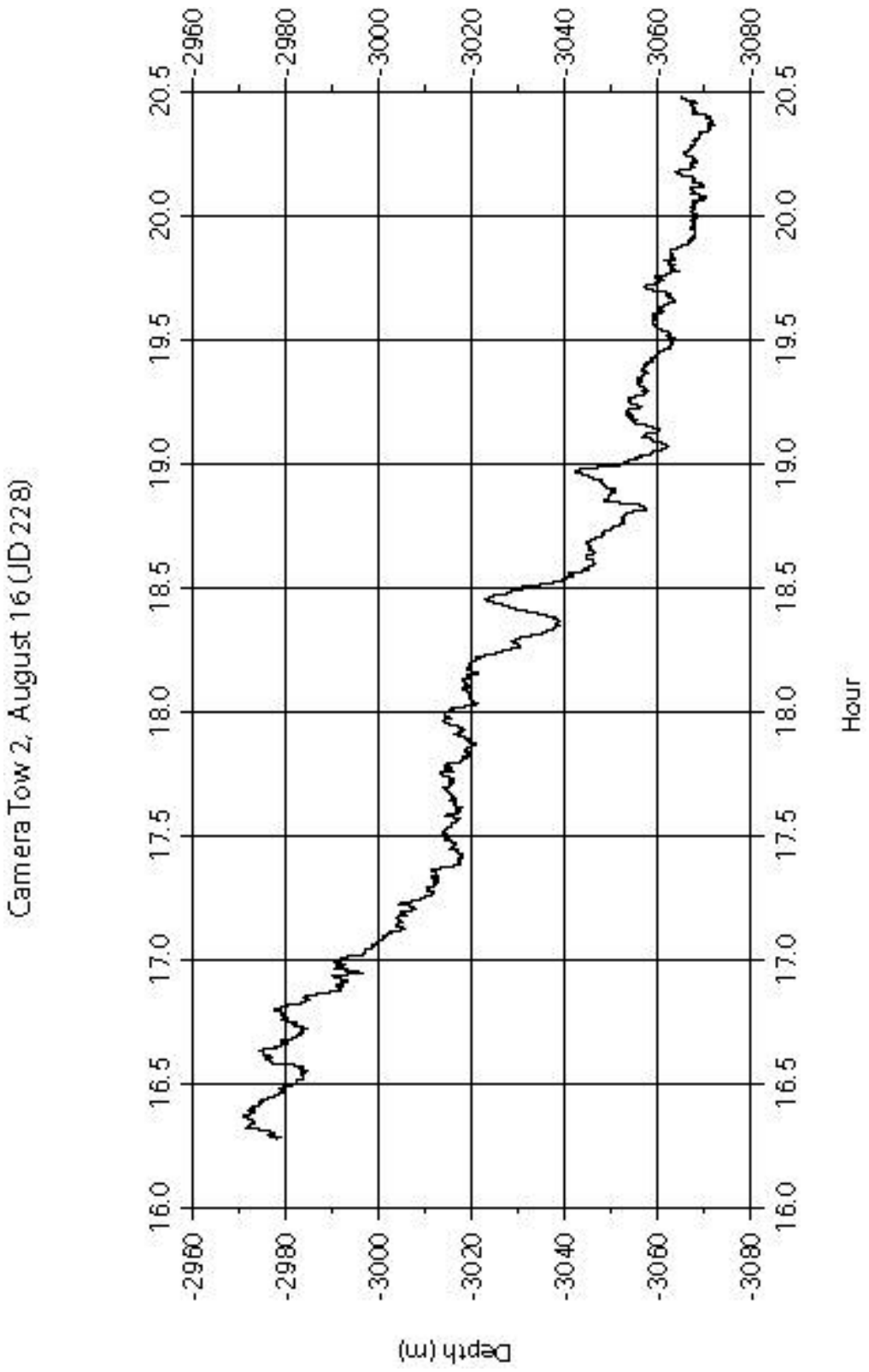
Aim: Tow 2 ran east to west from the linking ridge to its intersection with the EPR. Our aim was to characterize the transition from EPR magmatism to linking ridge magmatism.

Results: Lavas with varying degrees of sediment cover were observed. In some places lavas had little to no sediment cover indicating that they were erupted fairly recently since sedimentation rate in the region is high: 2-3 cm/1000 yr. Cracks and fissures with various orientations were also observed and need to be constrained further. Mounds of altered, reddish deposits were seen and inferred to be extinct hydrothermal vents.

9.2a- CT02 Track Plot:



9.2b- CT02 Profile:

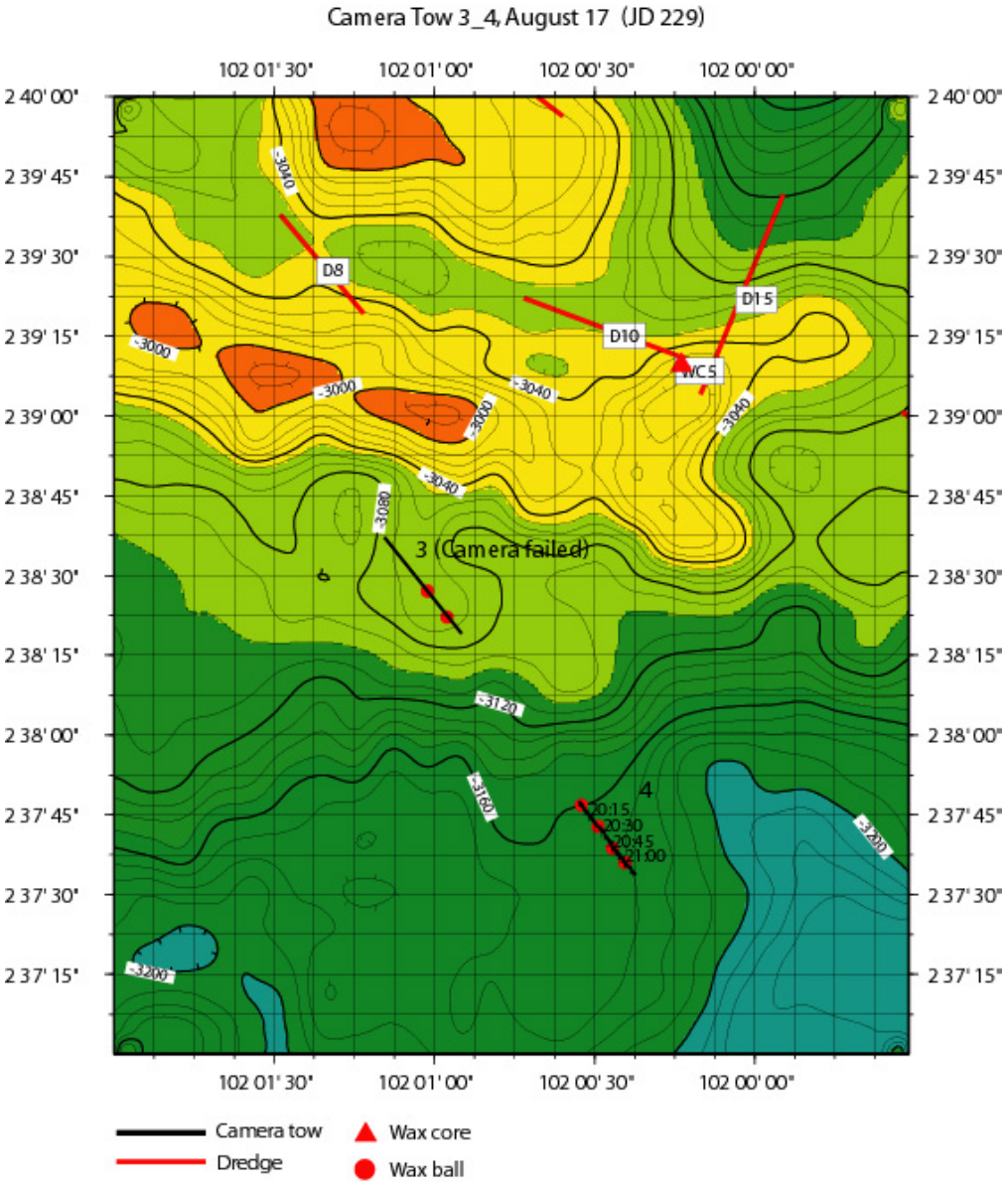


9.3: Camera Tows 3 & 4

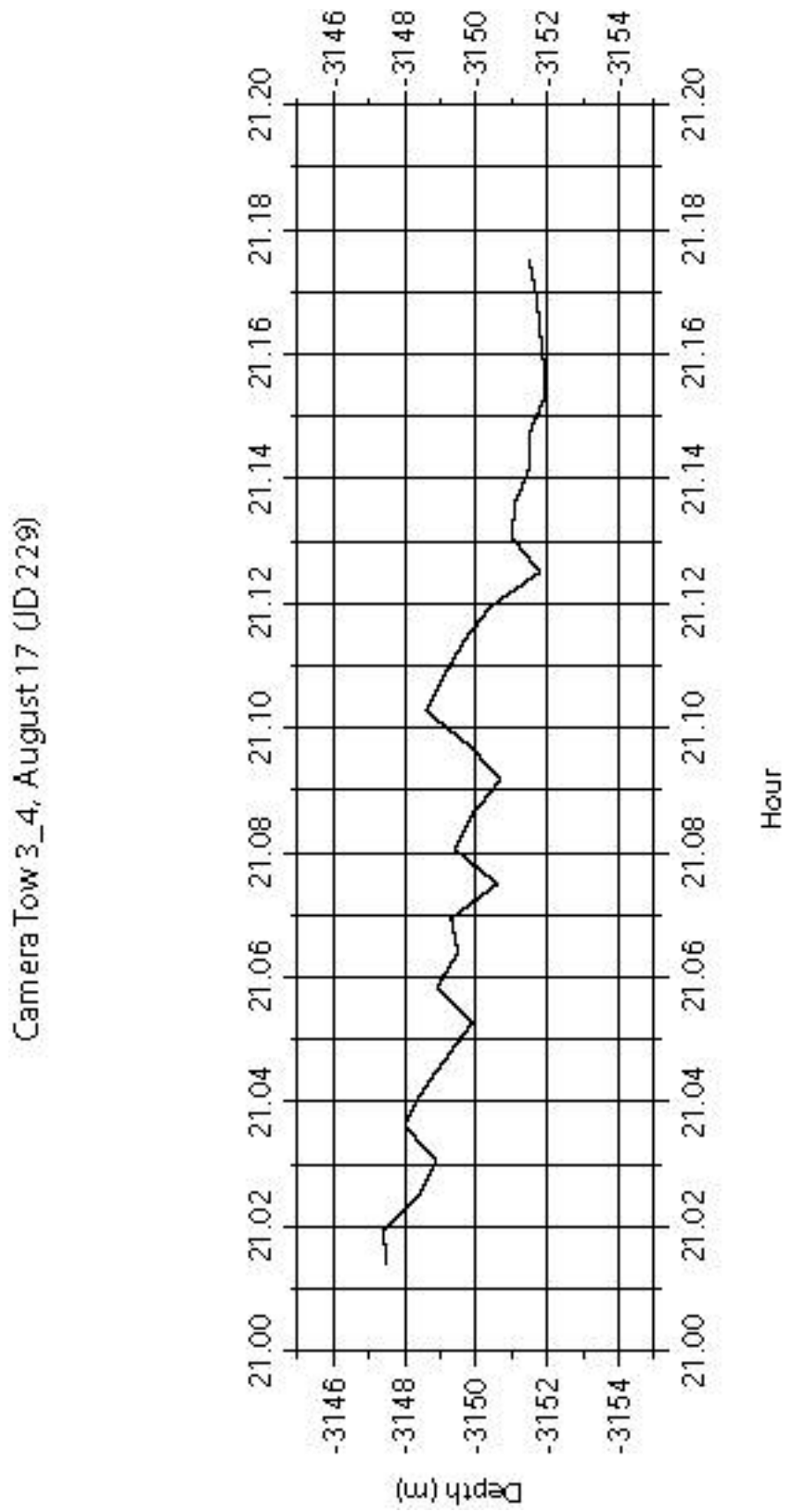
Aim: Tow3_4 was run on an apparent lava delta emerging from the south flank of the linking ridge, near the transition to the magmatic gore tip. Our aim was to determine whether the feature was constructional and its relative age.

Results: The camera failed to start on Tow 3. After testing the camera we redeployed it as Tow 4 and spent ~1 hour photographing the delta. We missed the part of the tow that would have photographed the slope leading to the delta. The delta was in large part heavily sedimented and it was impossible to determine the type of rocks that it was constructed of. However, in the middle of the tow we encountered a flow that overlaid the sedimented terrain, apparently flowing to the east. The source of this flow is unknown, but it indicates that this part of the rift may still be volcanically active. The only other feature observed was a fissure near the end of the tow.

9.3a- CT03/04 Track Plot:



9.3b- CT03/04 Profile:

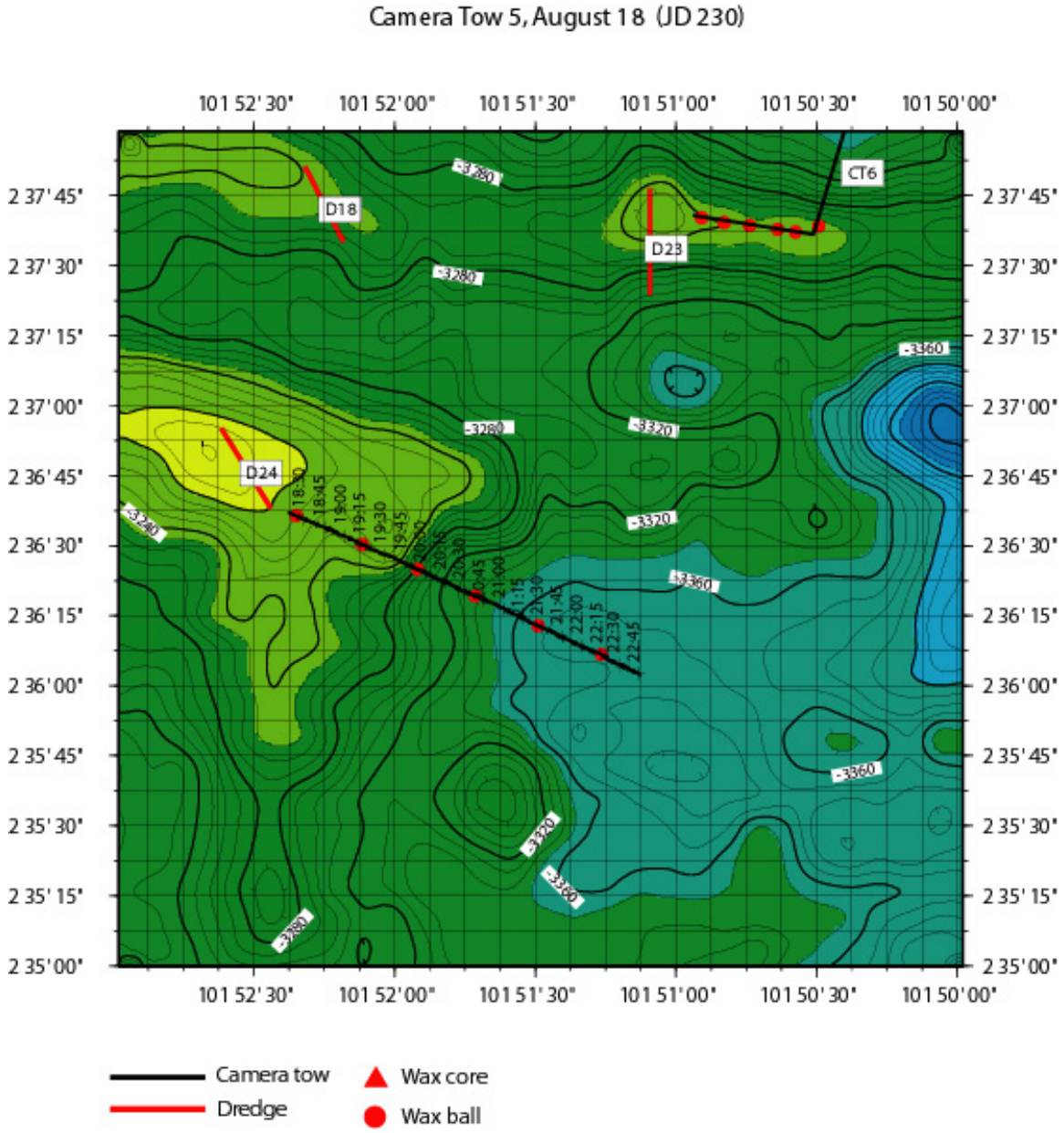


9.4: Camera Tow 5

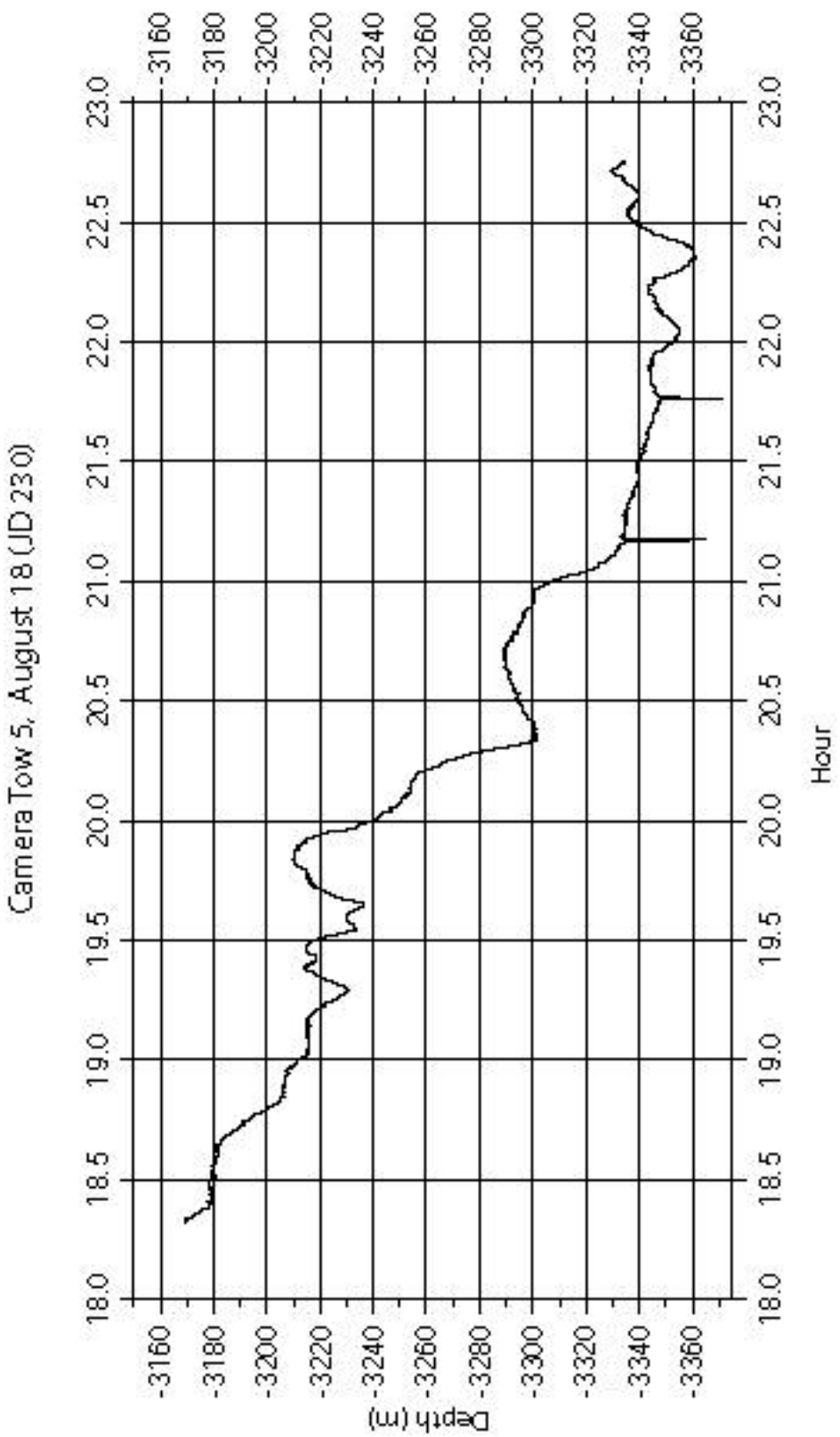
Aim: Tow 5 was designed to look at the south branch of the volcanic ridge that leads from the magmatic gore tip eastward. The track led from the top of the volcanic ridge into the deep to the southeast to determine the relative age of the deeper section.

Results: We did not get pictures at the very top of the ridge, but started a little to its southeast. Here the terrain was heavily sedimented. As the camera went down the steeper parts of the slope, lavas were exposed, some were elongate pillows. There was rubble at the base of the slope, but the slope was not extremely mass wasted as observed elsewhere in younger volcanic terrain (e.g., Puna Ridge). In the deep, the bottom was almost totally covered with sediments with only minor exposures of basalts.

9.4a- CT05 Track Plot:



9.4b- CT05 Profile:

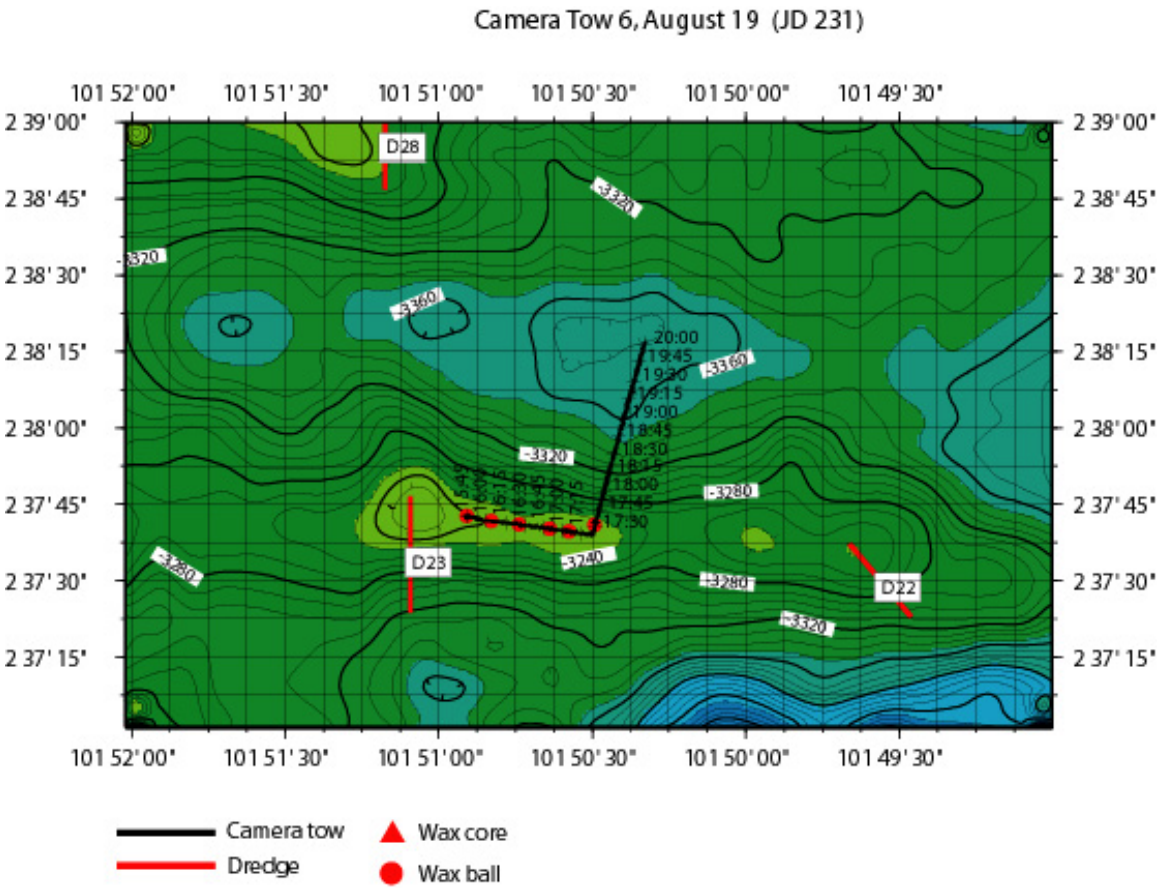


9.5: Camera Tow 6

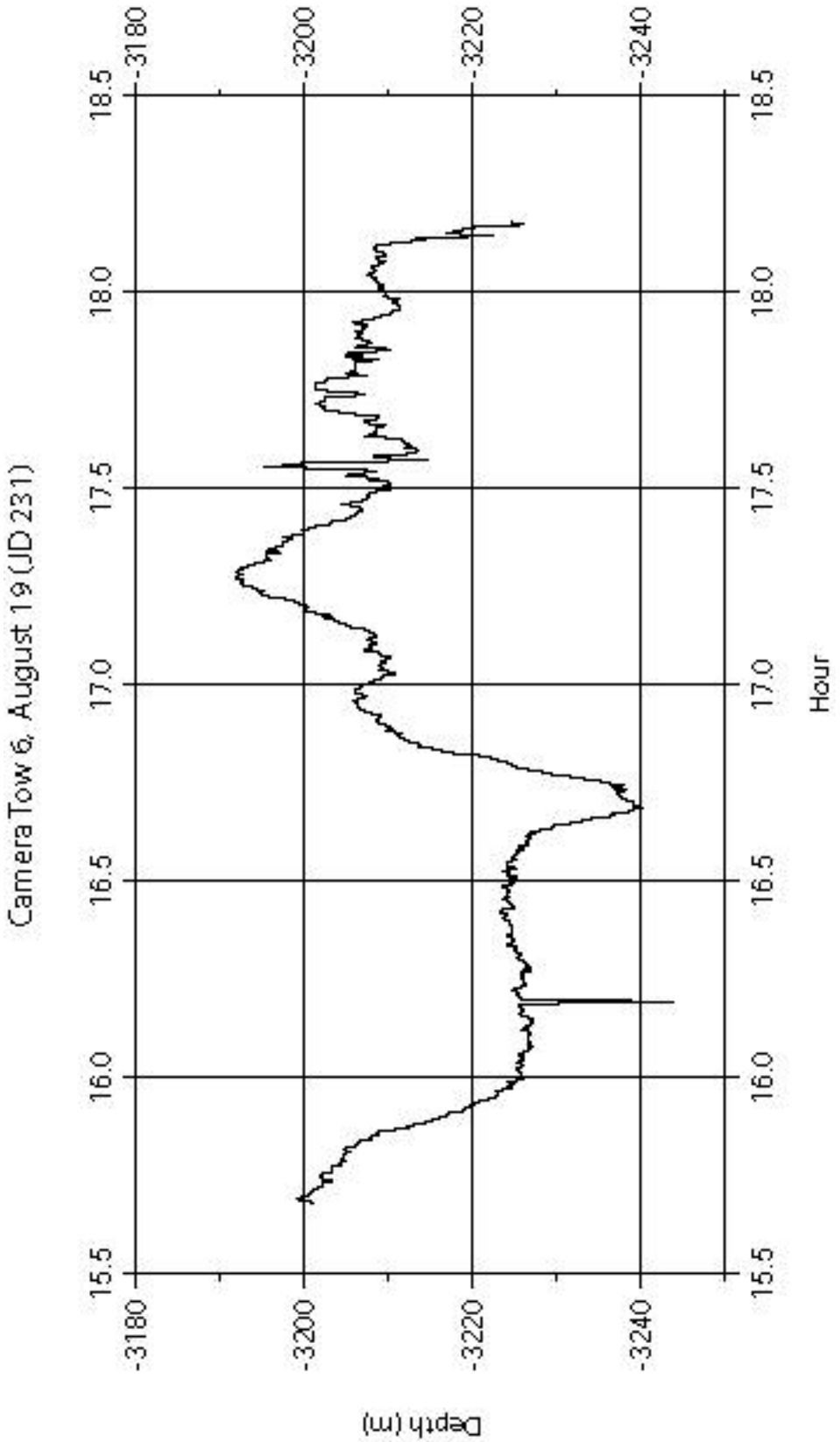
Aim: Tow 6 was designed to look at the middle volcanic branch that leads from the magmatic gore tip eastward. The track led along the top of the ridge and then turned north into the bounding deep.

Results: The top of the ridge was sedimented, but lavas were exposed. We paralleled an east-west crack before turning north over the edge of the ridge. The north-facing scarp was composed of massive basalts and mass wasting had sent rubble down the slopes. In places the scarp was too steep to follow with the camera sled; in other places the slope was more gentle and composed of sedimented basalts. East-west cracks were seen. At the end of the tow the terrain became more heavily sedimented and cracks and fissures were abundant.

9.5a- CT06 Track Plot:



9.5b- CT06 Profile:

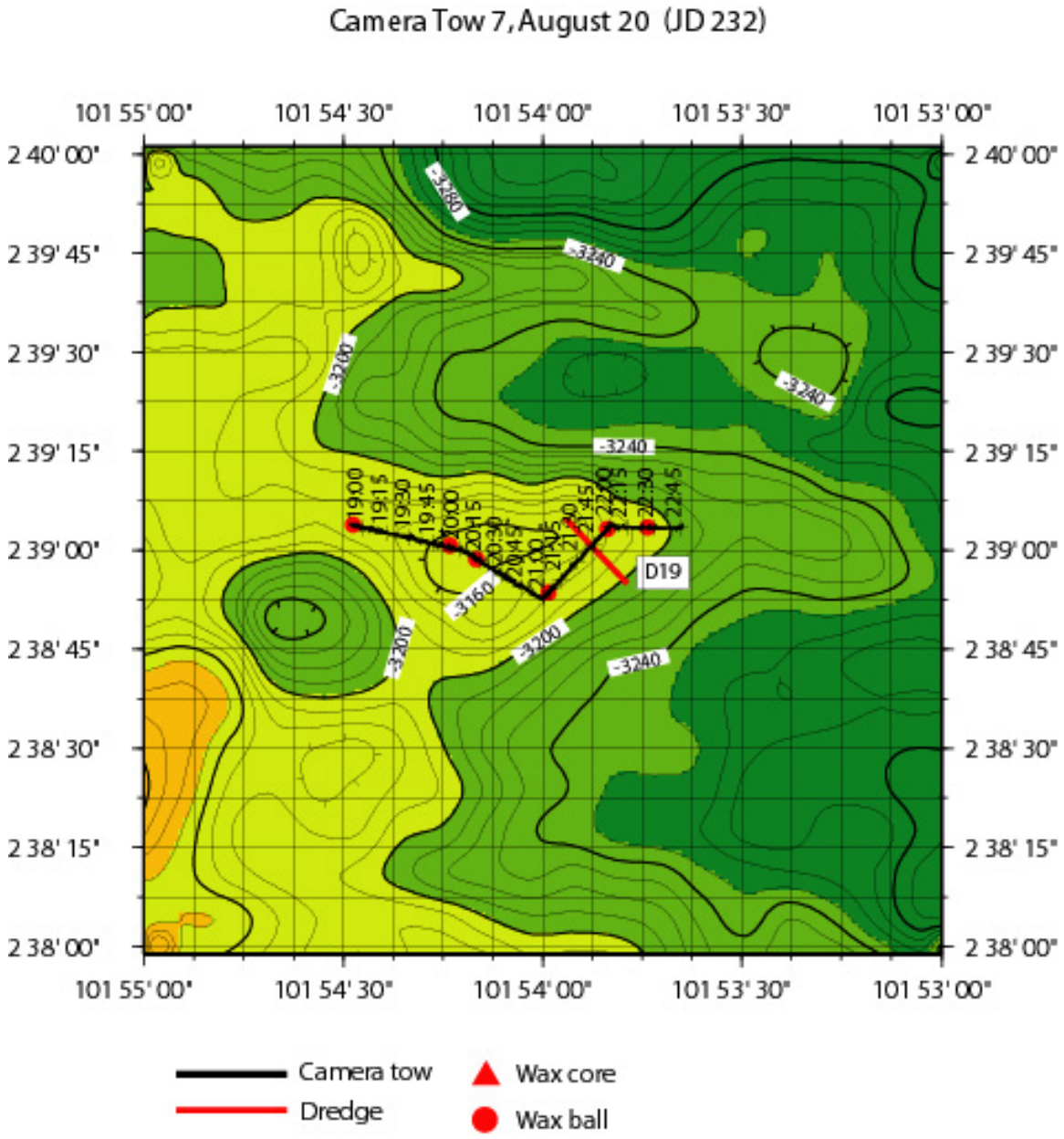


9.6: Camera Tow 7

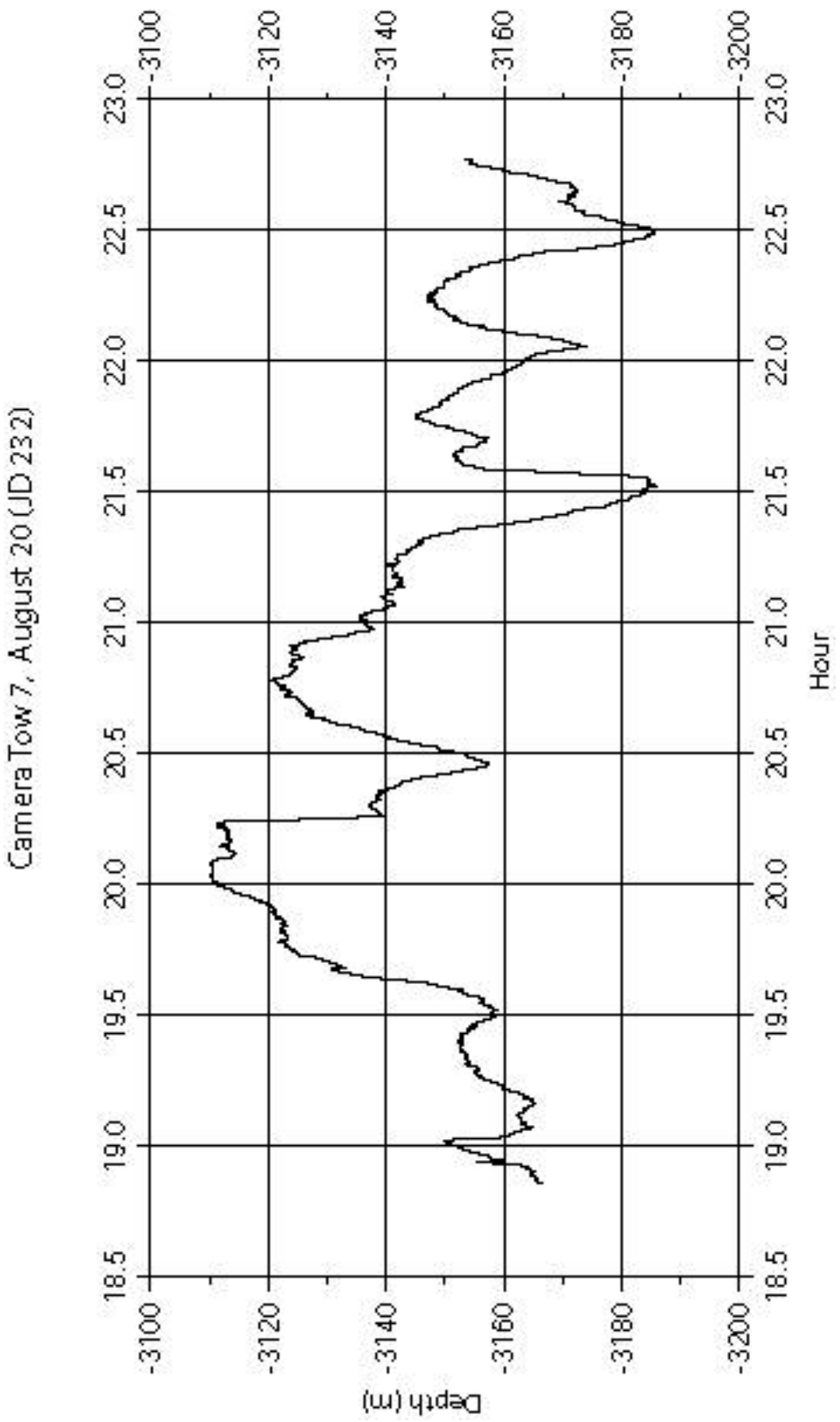
Aim: Tow 7 was designed to characterize the northern volcanic ridge leading from the magmatic gore tip to the east. The track zigzagged over the peak of the ridge, from west to east.

Results: The tow started along a scarp running along the northern part of the ridge and then moved onto sedimented lavas on the top. Sediment thickness varied along the track with some places being mostly sediment free. We went over a large scarp (~40 m) near the southern edge of the peak and the track was modified to parallel this scarp rather than try to go over it with the camera sled.

9.6a- CT07 Track Plot:



9.6b: CT07 Profile:

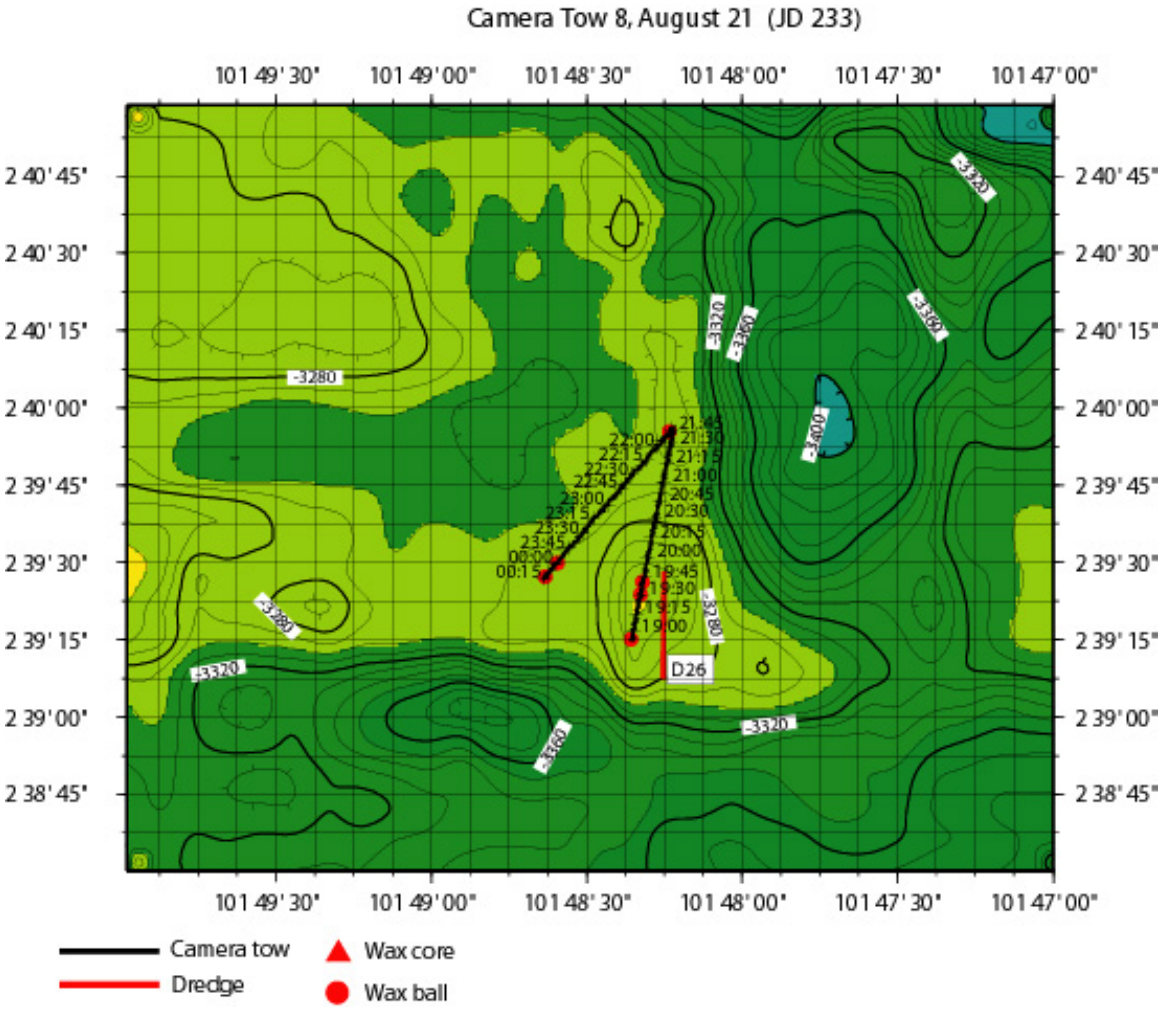


9.7: Camera Tow 8

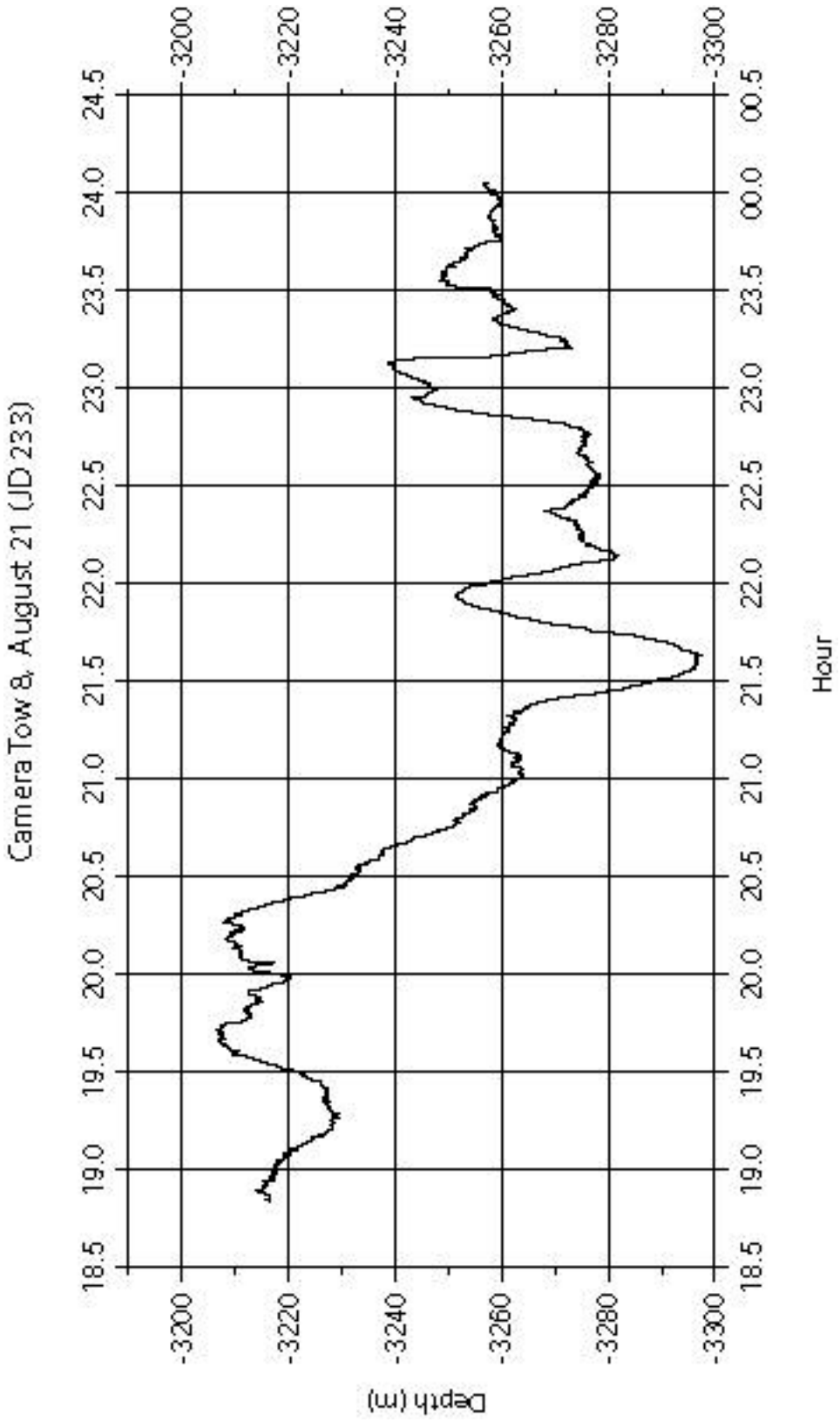
Aim: Tow 8 was designed to look at another section of the northern volcanic branch, eastward of Tow 7. Although this ridge had an east-west orientation, it also extended to the north at its eastern end suggesting that it might have been an old abyssal hill generated at the EPR. The aim of Tow 8 was to see if we could discriminate between EPR generated features and those generated at the IR.

Results: The tow started on the eastern end of the ridge heading north. The top of the ridge was heavily sedimented with few basalts exposed. Numerous east-west cracks were crossed. Scarps with massive basalts exposed were also crossed. At the end of the section of the track that headed north, at the deepest part, the terrain was heavily sedimented. On the southwest part of the track rubble was observed. There was also a section covered by lavas with little sediment. More cracks and fissures were photographed. At the end, the terrain was heavily sedimented.

9.7a- CT08 Track Plot:



9.7b- CT08 Profile:

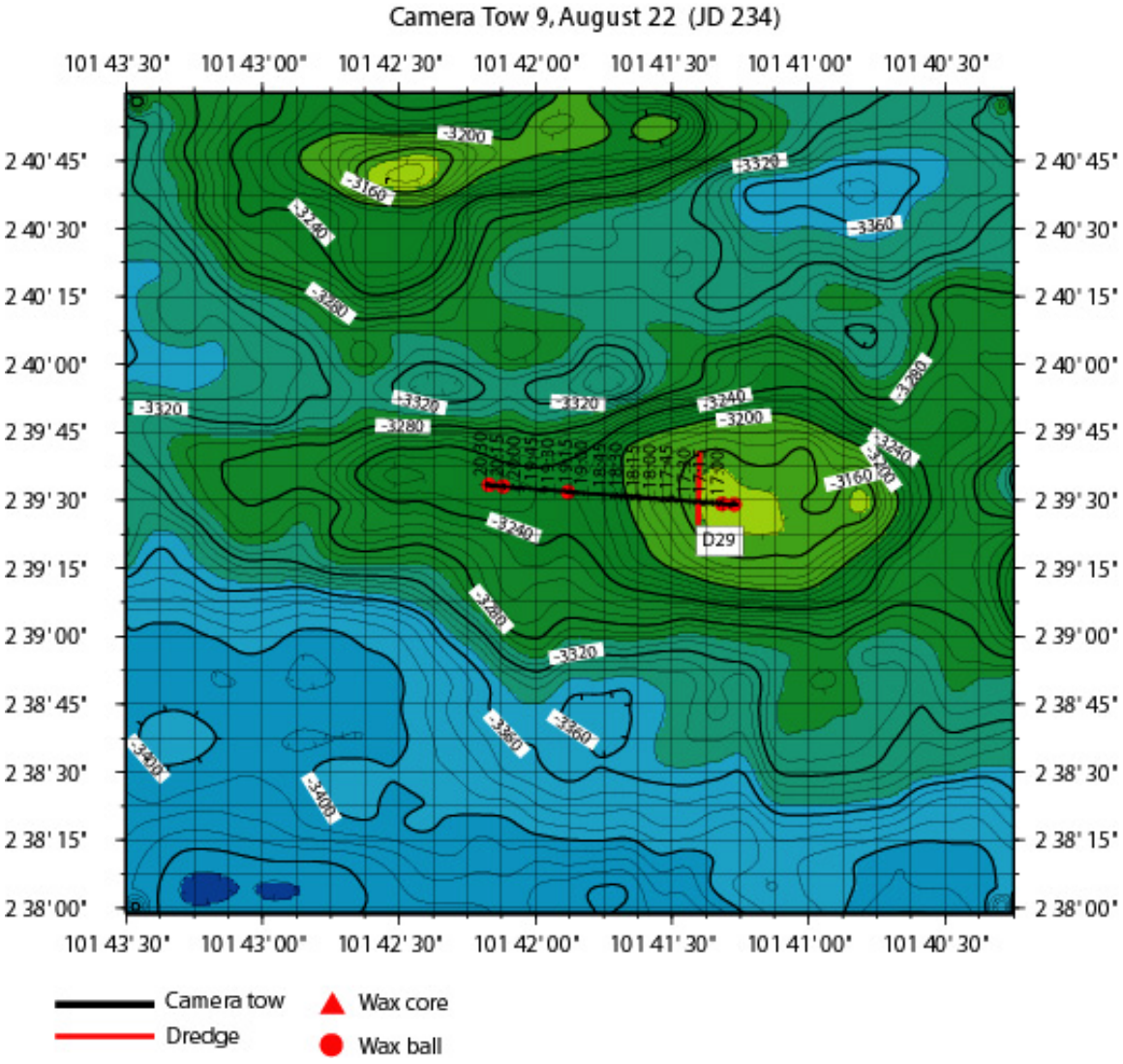


9.8: Camera Tow 9

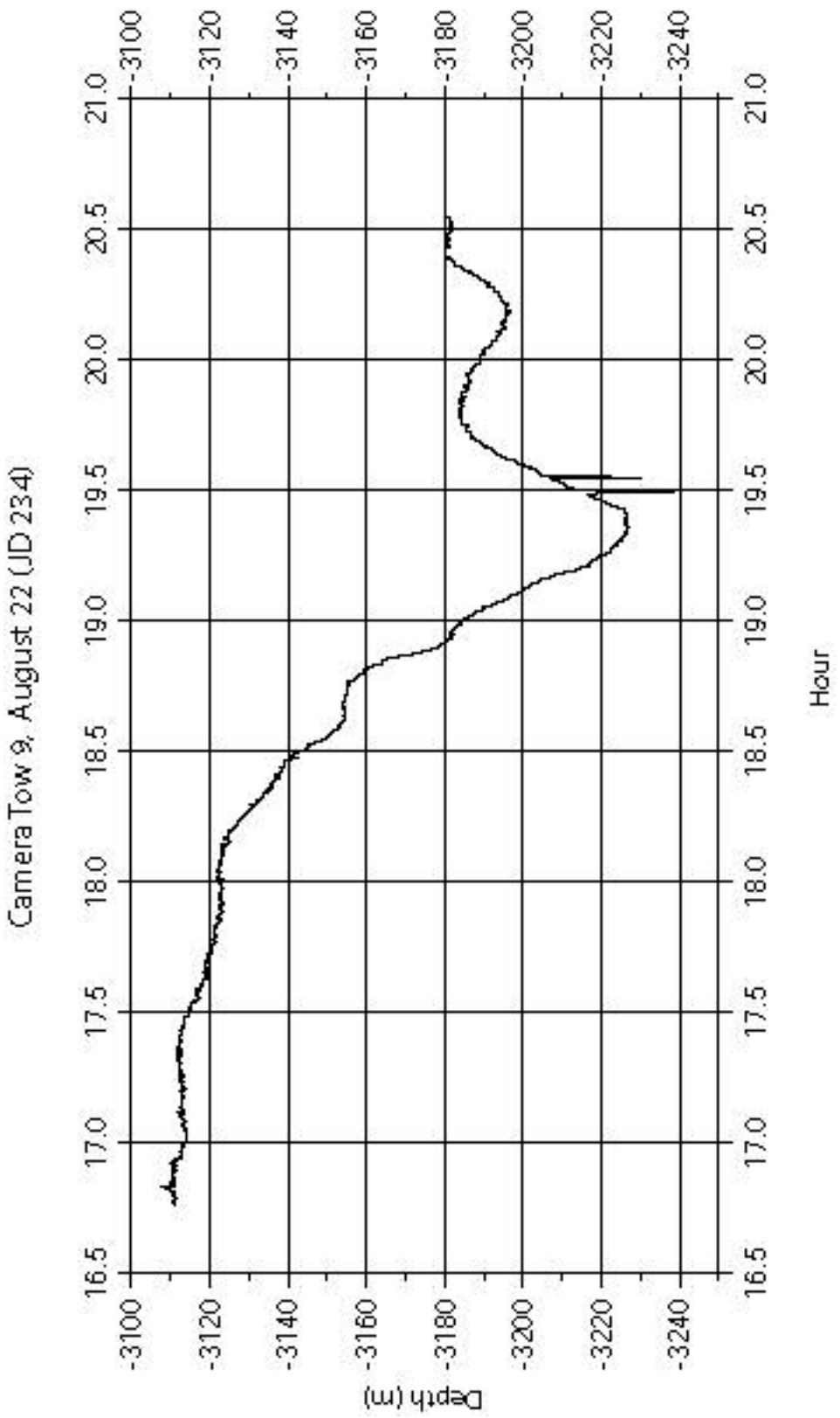
Aim: Tow 9 was aimed to look at one of the volcanoes associated with the large volcanic ridges in the northern section of the rifted gore. We were interested in finding out whether these features might still be volcanically active.

Results: This feature was completely sedimented. Perhaps 5% of the 690 photos showed basalts poking through the sediment. Because of this camera tow we decided to move our sampling and mapping efforts back to the south to focus on the magmatic axis of the IR.

9.8a- CT09 Track Plot:



9.8b- CT09 Profile:



9.9: Camera Tow 10

Aim: Tow 10 was aimed at looking at a volcano that straddles the scarp that defines the southern boundary of the IR gore. This volcano might have been built on old EPR crust with subsequent faulting associated with the IR not having cut through it, or it might have erupted after the faulting. The track led from the top of the volcano down its northern flank into the deep.

Results: The volcano was heavily sedimented with small patches of basalts poking up through the sediments. Its northern flank was also heavily sedimented with some sections showing mass wasting and resulting rubble. East-west oriented cracks were also crossed. It was not clear that the camera made it to the deepest part of the track. The last few images showed sedimented terrain with minor basalt outcrops.

9.9a- CT10 Track Plot: