OVERVIEW OF RECENT RESULTS FROM THE OPPORTUNITY ROVER AT VICTORIA CRATER.
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Victoria crater is an impact crater about 800 meters in diameter that lies roughly 5 km south of the landing site of the Opportunity rover. For more than a year, Opportunity has been engaged in exploration of this, the largest impact crater encountered by either rover.

The shape of Victoria crater is unusual. The rim is characterized by a number of prominent alcoves that are U-shaped in plan view, separated by sharp promontories that project toward the crater interior. The alcoves are clearly sites of mass wasting, and this distinctive shape indicates that the crater has been enlarged significantly by mass wasting and erosional processes.

After arriving at the crater's rim, Opportunity traversed along the rim imaging the stratigraphy exposed on the promontories (Fig 1). The promontories are quite steep, and most of them expose several to many meters of intact bedrock on near-vertical faces. Because Victoria crater is so large, by imaging these faces we have been able for the first time study lateral sedimentary facies variations at Meridiani over horizontal length scales of hundreds of meters.

Opportunity's original arrival at Victoria Crater took place at Duck Bay, along the western rim of the crater. The rover then traversed clockwise more than 30% of the way around the crater, ending the traverse at Tierra del Fuego. Along the way, imaging campaigns were conducted on a number of the promontories, including some "super-resolution" imaging in which we acquired multiple images and added them to increase signal to noise ratio and allow spatial filtering to improve angular resolution.

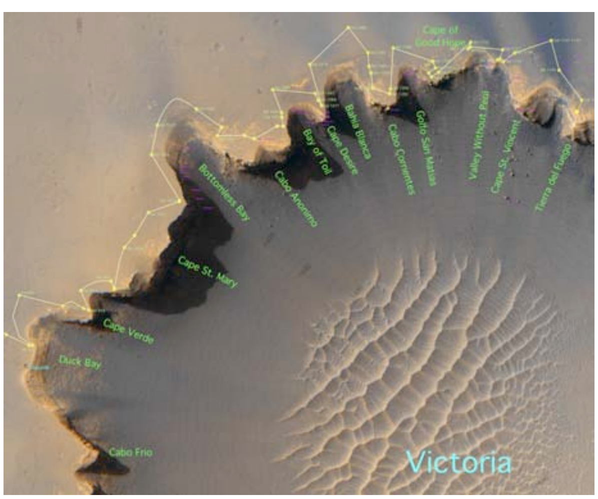

Fig. 1: Opportunity's initial traverse along the rim of Victoria Crater, from Duck Bay to Tierra Del Fuego.

Pancam observations of the promontories on the north side of Victoria crater show them to be dominated by eolian facies. No clasts are visible in Pancam images; evidently the grain size is too small everywhere to be revealed by Pancam, as is the case everywhere else at Meridiani. Bedding, however, is prominent.

At Cape St. Mary, Pancam super-resolution images (Fig. 2) show meters-scale trough-geometry cross stratifictation indicating migration of large sinuous-crested eolian bedoforms in a direction perpendicular to the cliff face. The cliff runs east-west, indicating a paleo-wind direction that is either north to south or south to north.

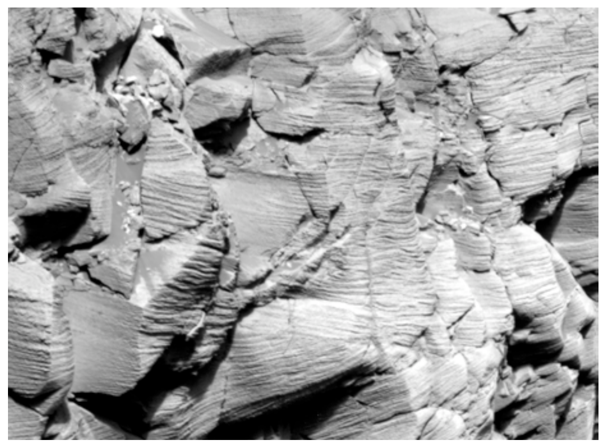

Fig. 2: Pancam super-resolution image of large-scale trough cross stratification at Cape St. Mary. Scale across the image is approximately 5 m.

Farther to the east, at Cape St. Vincent, a single ~7-meter thick climbing eolian bedform is observed. The face of Cape St. Vincent runs north-south, and the beforms climb toward the south. This observation resolves the ambiguity over wind direction, indicating a paleo wind from the north.

Recent super-resolution images of Cape Verde (Fig. 3) show spectacular fracture fills that (as with fracture fills elsewhere at Meridiani) we interpret to result from fluid migration along fracture planes. Notably, a promintent fracture fill at Cape Verde is truncated by an erosional surface that is in turn overlain by low-angle cross-stratified eolian deposits. This relationship demonstrates that the emplacement of the deposits did not take place in a single event, but instead there were multiple episodes of deposition, scour, and transport, separated in time by episodes of fluid migration.

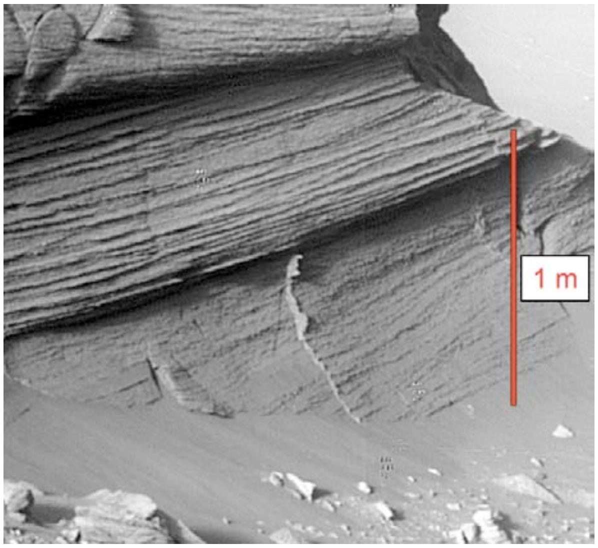

Fig. 3: Pancam super-resolution image of the lower portion of Cape Verde, showing a prominent fracture fill truncated by an erosional surface.

A very prominent feature observed all the way around Victoria crater is a bright band in the stratigraphy, immediately below the original pre-impact surface. Pancam super-resolution images at Cape St. Vincent show that bedding cuts across this banding at an oblique angle, indicating that the banding is not a primary depositional feature. Instead, we hypothesize that it is diagenetic in origin, perhaps analogous to a prominent diagenetic contact previously observed by Opportunity at Endurance Crater.

As of this writing, Opportunity has entered Victoria Crater at Duck Bay, and is engaged in detailed study of the physical and chemical stratigraphy immediately below the original pre-impact surface. To date we have identified three distinct stratigraphic units, named (from top to bottom) Steno, Smith, and Lyell. Steno and Smith correspond with the bright band observed elsewhere around the crater. All threee units exhibit lamination, although in Lyell the lamination is coarser and Microscopic Imager images reveal a porosity similar to what was seen in the upper portions of the stratigraphy at Endurance Crater. The SO_3 concentration in Steno is among the highest observed anywhere at Meridiani; SO_3 in Smith and Lyell is notably lower. Lyell is strongly enriched in Cl relative to Steno and Smith. Decreasing SO_3 and increasing Cl with depth were also observed at Endurance Crater.

After completing examination of the Steno-Smith-Lyell stratigraphy, Opportunity may descend deeper into Victoria Crater, in search of deeper bedrock and higher-resolution imaging of Cape Verde.