AN EAST TO WEST MINERALOGICAL TREND IN MARS EXPLORATION ROVER SPIRIT MÖSSBAUER SPECTRA OF HOME PLATE. C. Schröder[1,2], K. Di[3], R.V. Morris[2], G. Klingelhöfer[4], R. Li[3], and the Athena Science Team, [1]NASA Postdoctoral Program Fellow, christian.schroeder-1@nasa.gov, [2]NASA Johnson Space Center, Houston, TX, [3]Ohio State University, Columbus, OH, [4]Johannes Gutenberg-Universität, Mainz, Germany.

Introduction: Home Plate is a light-toned plateau ~90 m in diameter within the Inner Basin of the Columbia Hills in Gusev crater on Mars. It is the most extensive exposure of layerd bedrock encountered by Spirit to date, and it is composed of clastic rocks of moderately altered alkali basalt composition, enriched in some highly volatile elements. Textural observations suggest an explosive origin and geochemical observations favor volcanism, probably a hydrovolcanic explosion [1]. Since it first arrived at Home Plate on sol 744, Spirit has circumnavigated the plateau (Fig. 1) and is now, since sol 1410, resting at its Winter Haven 3 location at the north end of Home Plate.

Results: The MER Mössbauer spectrometers determine Fe oxidation states, identify Fe-bearing mineral phases and quantify the distribution of Fe among oxidation states and mineral phases [2]. Mössbauer spectra of Home Plate bedrock were obtained in five different locations from nine different targets (Fig. 1): Barnhill Ace, Posey Manager, and JamesCoolPapaBell Stars at the northwest side of Home Plate; Pesapallo, JuneEmerson, and ElizabethEmery on the east side; TexasChili on the south side; PecanPie on the west side; and Chanute on the north side.

There is very little variation in spectra from a given location, although different layers were specifically targeted on the northwest location and the eastern locations. The target Barnhill Ace, for example, belonged to the lower unit of Home Plate whereas the targets Posey Manager and JamesCoolPapaBell Stars belong to the upper unit [1]. There is a difference in elevation of a couple of meters between Barnhill and JamesCoolPapaBell and yet the Mössbauer spectra from these targets look virtually the same [1,3]. There is, however, substantial variation in spectra from different locations. The greatest differences occur between spectra from the east side and the west side, whereas spectra from locations that are roughly on the same longitude are very similar to each other (Fig. 2). Pyroxene (Px) and magnetite (Mt) were identified in all Mössbauer spectra of Home Plate bedrock targets, but there is a clearly visible trend from little or no olivine (Ol) and little nanophase ferric oxides (npOx) in the east to a moderate increase of olivine and a substantial increase of nanophase oxides on the western side of Home Plate (Fig. 2). This trend may not strictly follow an east-west direction, but could also be tilted towards a southeast-northwest direction.

Discussion: Differences between the eastern and western rims of Home Plate are also seen by other instruments. In Spirit Pancam and MRO HiRISE observations the western rim appears spectrally 'redder' than the eastern rim, indicating a greater level of oxidation [4]. Whereas there is no difference in the major element composition between the east and west sides of Home Plate, volatile elements Zn, Ni, and K are enriched in the east and Cl and Br are greater in the west [5].

Home Plate is not a level plateau, but in fact slopes from high elevation in the south and east towards lower elevations in the north and west (Fig.1). The difference between east and west side is approximately 4.4 m. As an interesting coincidence, both npOx and Ol in the Mössbauer spectra seem to increase with decreasing elevation.

Ol and npOx increasing together seems anti-intuitive, but the Mössbauer data may in fact record separate trends of mineralization and subsequent alteration. Vesicular basalts investigated in the vicinity of Home Plate such as the rock Esperanza have the same Fe mineralogical composition as eastern Home Plate: rich in Px and Mt, no Ol and little npOx. Therefore, we interpret the mineralogical composition of eastern Home Plate as a record of igneous crystallization rather than the loss of Ol to alteration processes. The deposits on the west side of Home Plate crystallized Ol in addition to Px and may initially have been tephra with Fe-bearing glass which subsequently altered to palagonite, giving the high proportion of npOx along with Px, Ol, and Mt.

Conclusions: Multi-instrument observations show geochemical and mineralogical differences between the eastern and western rims of Home Plate. Rocks on the eastern rim are relatively unaltered, and rocks on the western rim are relatively alterd as indicated by their higher nanophase ferric oxide content. The changes in Mössbauer mineralogy follow the elevation gradients of Home Plate.

References: [1] Squyres S.W. et al. (2007) *Science, 316*, 738-742. [2] Klingelhöfer et al. (2003) *JGR, 108*, 8067, doi:10.1029/2003JE002138. [3] Morris R.V. et al. (2008) *JGR*, to be submitted. [4] Farrand W.H. et al. (2008) *LPS XXXIX*, this issue. [5] Schmidt M.E. et al. (2008) *LPS XXXIX*, this issue.

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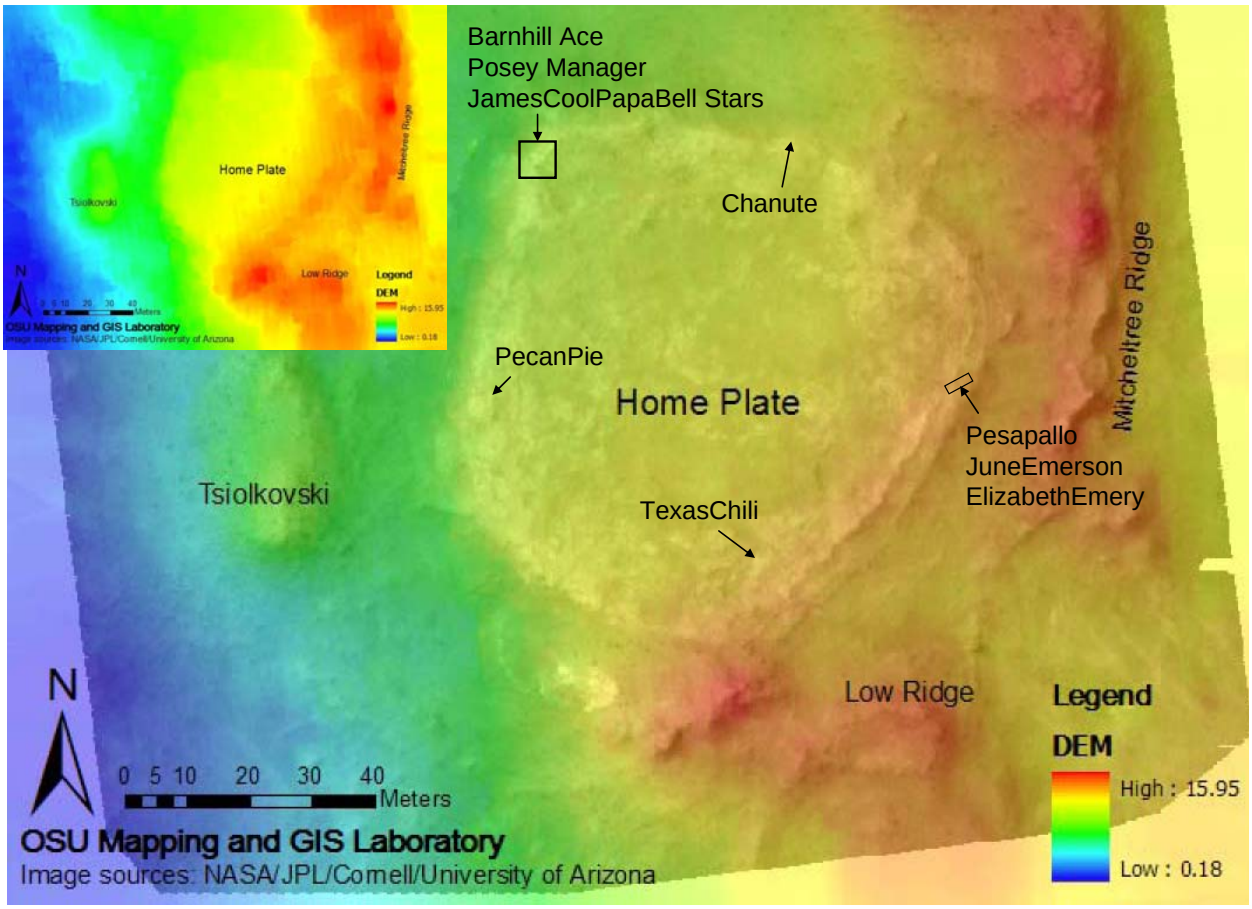

Figure 1. HiRISE Image with digital elevation map of Home Plate. The locations of the Mössbauer targets are indicated by arrows. Inset is a smoothed out elevation map

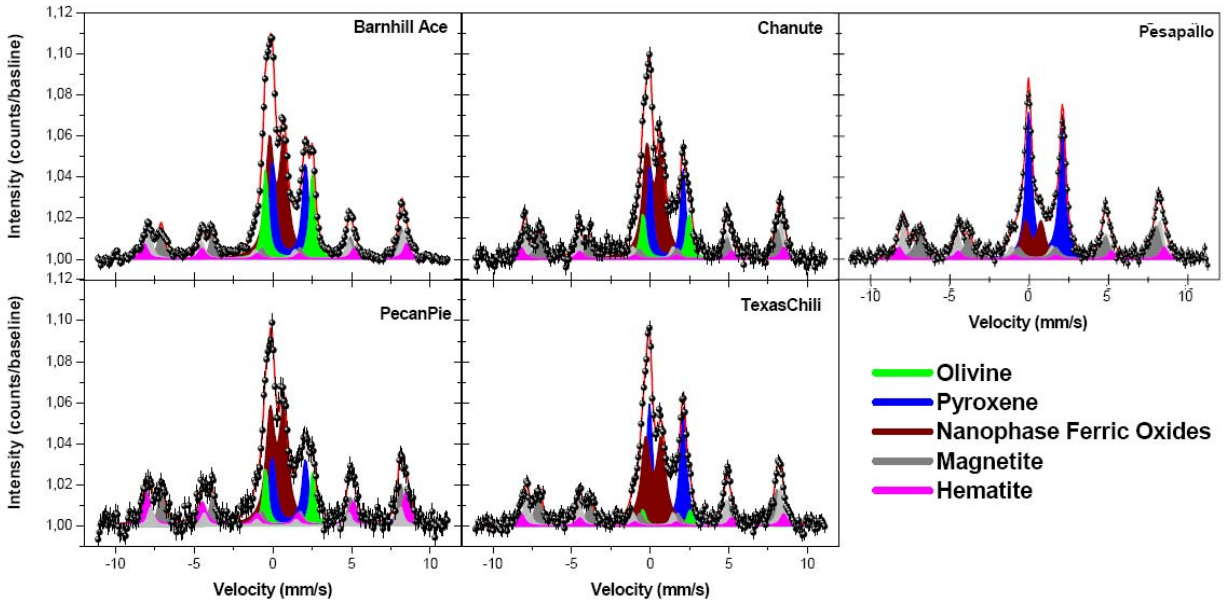

Figure 2. Mössbauer spectra of representative targets from five different locations. Rows correspond to relative latitude, columns correspond to approximate relative longitude.