A PRELIMINARY REPORT ON THE STRUCTURE OF MONTURAQUI CRATER, CHILE. K. Rathbun[1], I. Ukstins Peate[1], S. Drop[1], and F. Gutierrez[2], [1]Dept. of Earth and Environmental Sciences, 121 Trowbridge Hall, Univ. of Iowa, Iowa City IA 52242 USA, [2]Dept. de Geología, Plaza Ercilla #803, Santiago, Chile (kathryn-rathbun@uiowa.edu)

Introduction: Monturaqui Crater is a small (~350 m diameter), simple crater located at the southern end of the Salar de Atacama basin in northern Chile. The crater was formed by a Fe-Ni projectile approximately 663 kya [1]. The target rock consists of Ordovician granite basement cut by several small (1 – 2 m wide) mafic dikes and overlain by thin (0 – 5 m), discontinuous Pliocene ignimbrite.

Small craters are often too eroded for detailed structural studies. Monturaqui is relatively well-preserved and retains the target rock sequence along most of the rim. This provides an opportunity to study the structural and erosional history of the rim at Monturaqui.

Field work: A nine-day field expedition was launched in November 2015 to investigate Monturaqui Crater. Goals of the investigation included field mapping and structural study of the crater.

Strike and dip measurements were taken around the rim where ignimbrite bedrock cropped out [Figs. 1A, 1B]. Multiple locations preserve bedrock with nearly vertical dips, and at least one location showed possible evidence of stratigraphic overturning based on its strike and dip and location relative to the other outcrops. Further field work is needed to confirm this.

The ignimbrite bedrock thickness is variable in the crater wall but is generally less than than 5 m thick. The thickness of the deposits at the rim and in the crater wall were not directly measured; however, it was noted that the ignimbrite looked unusually thick (>5 m) in multiple areas. In addition, a continuous layer of resistant ignimbrite within the ignimbrite deposits was documented around much of the crater [Fig. 1C].

Discussion: The strike and dip measurements taken from around the crater rim all reflect some degree of rim uplift, as would be expected. The highest dip measurements are found on the top of the eroded rim, suggesting that the fold hinge of the overturned rim sequence is nearby but unexposed.

The thickness of rock preserved in the crater wall at Barringer Meteor Crater, AZ has previously been used to identify the fold hinge of an overturned rim sequence [2]. The uneven thickness of the ignimbrite at Monturaqui complicates such an assessment. The pre-impact topography was hilly with discontinuous deposits of ignimbrite that tend to concentrate in low-lying areas. Since the ignimbrite does not have constant thickness it is difficult to determine if it shows evidence of thickening at the rim due to the impact.

The resistant ignimbrite layer in the crater wall is laterally continuous but has variable elevation around the crater. While several mechanisms could cause this variation in elevation, it is likely, given the pre-impact topography, that this resistant layer is a reflection of the hilly nature of the pre-impact topography.

It has been previously suggested that the preferential elongation of Monturaqui is due to pre-existing uneven topography, or that it may be an artifact of a SE-trending projectile during the impact. The location of dark impact melt (“impactite”) on the SE flank of the crater [3] has been used to support this. However, this study documented dark impact melt on the eastern and northeastern flanks of the crater as well as fragments of iron shale on the northeast crater flank. This discovery means that the direction of the projectile will need to be reassessed.

Conclusions: The rim of Monturaqui shows evidence of structural overturning and possible stratigraphic overturning. The exposure of a possible fold hinge and the fact that the outcrops are ignimbrite suggest at least 5 m of erosion. Further study of the ejecta distribution may provide additional clues about the preservation of the overturned sequence at Monturaqui.

References: [1] Ukstins Peate I. et al. (2010) *LPSC 2010*, Abstract #2161. [2] Kring D.A. (2007) *LPI Contribution* #1355, 150 pp. [3] Kloberdanz C. (2010) Geochemical analysis of the Monturaqui impact crater, Chile. M.S. thesis, Univ. of Iowa, 188 pp.

Acknowledgements: This study was funded by the Barringer Family Fund for Meteorite Impact Research, the T. Anne Cleary International Dissertation Research Fellowship, and a grant from the Center for Global and Regional Environmental Research at the University of Iowa. The authors would also like to thank Cristian Tambley of Campoalto Operaciones for his invaluable help with logistics.

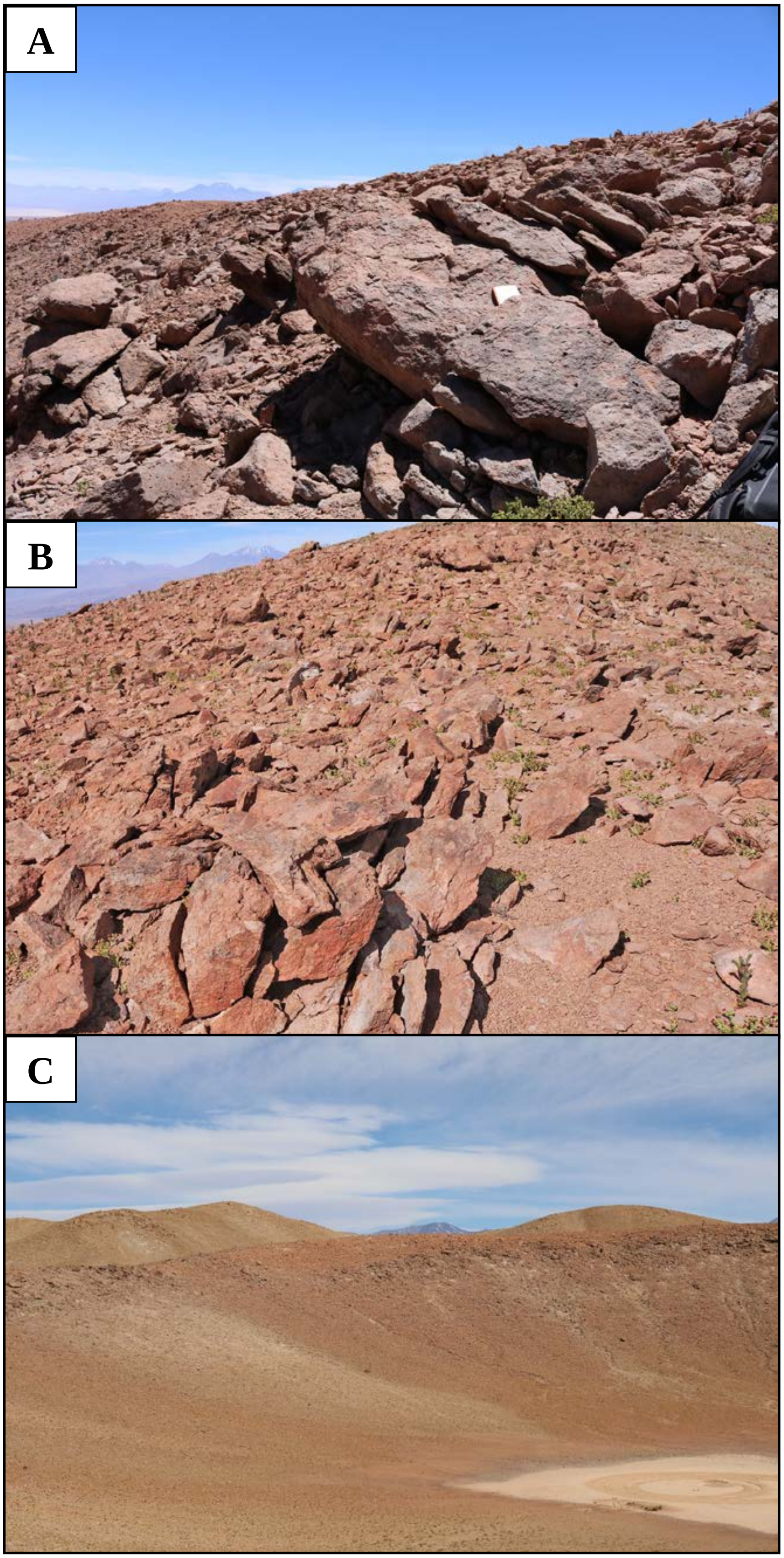

Fig. 1. Field photos from the 2015 field season at Monturaqui.

(A) Outcrop on the SE side of the crater.

(B) Outcrop on the east side of the crater. Most dips in this area are greater than 70 degrees.

(C) The resistant layer of ignimbrite can be clearly seen in this field photo. The elevation of the layer does not remain constant in the crater wall and is likely a reflection of the hilly nature of the pre-impact topography.