We invert both GNSS data and InSAR data with dMODELS. magma sources embedded in a homogeneous and elastic half space. The active Ol Doinyo Lengai, the two dormant volcanoes, Gelai and Elucidating the Magma Plumbing System of the Active Volcano Ol Doinyo Lengai, Natron Rift, Tanzania Using Geodesy and Numerical Modeling N. Daud, D. S. Stamps, M. Battaglia, M. H. Huang, E. Saria, K. H. Ji, K. Popolizio dntambila@vt.edu, dstamps@vt.edu, mbattaglia@usgs.gov, mhhuang@umd.edu, saria.elifuraha@gmail.com, khji@kigam.re.kr, kelspop@vt.edu Virginia Tech, USA – USGS and the University of Rome, Italy – University of Maryland, College park, USA – Andi University, Tanzania – Korea Institute for Geosciences and Mineral Resources 

1.0 INTRODUCTION Volcanic deformation evolves through a series of distinct stages during continental rifting and is a key element in causing geohazards. Volcanic eruptions are governed by the magmatic plumbing system of the volcano which sets the stage, style, occurrence and the magnitude of eruptive activity. An understanding of magma plumbing systems is vital for effective volcanic monitoring and hazard mitigation.

2.0 TECTONIC SETTING The time goal is to investigate the magmatic system of Ol Doinyo Lengai and numerical modeling to better understand the subsurface plumbing system.

3.0 METHODS

3.1 Global Navigation Satellite System (GNSS) We use five years of data (2016 – 2021) from the TZWOLCANO network (Figure 1A). We process GNSS observations using GAMIT/GLOBK software (Herring et al., 2010). The time-series (Figures 3) from TZWOLCANO were processed to examine and monitor the subsidence time activity of the volcano.

3.2 Interferometric Synthetic Aperture Radar (InSAR) We use five years (2016-2021) of the Copernicus Sentinel-1A/B ENVISAT and Sentinel-1C/D data to perform InSAR analysis. We use the TZWOLCANO coordinate receiver (TZWOLCANO) to perform the InSAR analysis.

4.0 RESULTS

4.1 GNSS velocity field solution We use 3D horizontal and vertical velocity field solutions of the TZWOLCANO for the time frame of June 2016 to July 2021 (Figure 6A, B) to 2 signs. The surface ground deformation was quantified using a local reference frame to the extent of the GNSS observations (Figure 6B). The resulting velocity field (Figure 6A) is used in the inversion of ground deformation around the Ol Doinyo Lengai.

4.2 InSAR velocity field solution We use both ascending (track 130) and descending (track 152) to estimate the vertical velocity field for the time frame of June 2016 to July 2021.

4.3 InSAR modeling of GNSS velocities with dMODELS We present a closing model for the Ol Doinyo Lengai (Figure 8A-C) at a depth of ~10 km that best fits the InSAR inversion.

5.0 DISCUSSION

5.1 Numerical Modeling with dMODELS We employ the dMODELS program (Battaglia et al., 2013) to invert GNSS and InSAR observations to determine the geometry and parameters of the volcanoes. The software is based on a weighted least squares inversion algorithm combined with a random search grid to determine the best fit parameters for the volcanoes. Deformation source by searching the minimum penalty function. We calculate the maximum velocity field (Figure 6A) is used in the inversion of ground deformation around the Ol Doinyo Lengai.

6.0 CONCLUSION

This work suggests a shallow deflation volcanic source at ~1 km depth east of ODL (Figure 9). The dike suggests a deep magmatic source at ~15 km (Bai et al., 2008; Calais et al., 2008; Biggs et al., 2013; Bezz et al., 2021).

7. REFERENCES