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Forced folding in a salty basin: Gada'-Ale in the Afar

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The Gada'-Ale Volcano in the Danakil Depression of Ethiopia is a curious shield-like, or flat dome-like volcanic centre in the Afar Rift. It has several fissure eruptions seen on its mid and lower flanks. It has an even more curious ring structure on its western side that has been interpreted as a salt diapir. The complex lies the central part of the basin where there are 1-2 km thick salt deposits. The area was active in 1990's (Amelung et al 2000) with no eruptive activity, but a possible intrusion. There was also an intrusion north of Gada'-Ale at Dallol in 2005 (Nobile et al 2012). Using Google Earth imagery, we have mapped the volcano, and note that: a) the main edifice has a thin skin of lava lying light coloured rock; b) that these thin deposits are sliding down the flank of volcano, and thrusting at the base. In doing so, they are breaking into detached plates. The light colour of the deposits, and the ability of the rock to slide on them suggest that are salt; Fractures on and around the volcano form curved patterns, around raised areas with several km diameter. These could be surface expressions of shallow sills. Putting the observations together with the known geology of adjacent centres like Dallol and Alu, we suggest that Gada'-Ale is a forced fold, created over a sill that has either bulged into a laccolith, or risen as a saucer-shaped sill. The upraised salt has caused the thin veneer of volcanics to slide off. That there are eruptive fissures on Gada'-Ale, and possible sill intrusions around the base suggests that the centre lies over a complex of sills that have gradually intruded and bulged the structure to its present level. Eruptions have contribute only a small amount to the whole topography of the edifice. We hope to visit the volcano in March and will being hot-off-the press details back to the EGU!