Geophysical Research Abstracts
Vol. 16, EGU2014-16633, 2014
EGU General Assembly 2014

The sub-volcanic structure of the Alnö carbonatite complex, Sweden

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The Alnö ring complex is one of the best known carbonatite complexes in the world, with ca. 100 scientific articles published since 1895. The Alnö complex hosts a suite of alkaline silicate and carbonatite rocks and is the type-location for the occurrence of magmatic carbonatites (Stutzer 1907). Many questions are left to be answered, however, in particular the detailed sub-surface structure of the complex is not well constrained. Two general models exist based on a two-dimensional downdip projection of magmatic sheets in relationship to a fixed point at the surface (von Eckermann, 1948; Kresten, 1980). Von Eckermann's model identifies several foci of magmatic sheets between depths of 1 km to 8km, whilst Kresten's model indicates that most magmatic sheets originated from a single evolving magma chamber at a depth of 1 km. To test these models we employed the Move® software package and produced a 3D model from the available data of sheet intrusions (see Burchardt et al. 2013 for the method). The model provides insights into the magma plumbing system and displays a highly complex sub-volcanic structure with several shallow magma chambers at depths of ca. 1 km below the surface. In addition, our model shows that a southward vergence of many magmatic sheets indicates that the source of these intrusion moved southward during the active phase at Alnö, consistent with Kresten's evolving main magma body. A single large magma chamber was recently suggested on the basis of seismic profiles (Andersson et al. 2013) and was pinpointed at 3 km below the surface. Our models indicate that this larger magma chamber probably represents the final stage of magmatic activity of Alnö, while Alnö's initial magma plumbing system was most likely a multi-pocket system with several storage levels, thus explaining the high abundance of magmatic sheets of divergent orientation and lithology.

REFERENCES

Andersson, M., Malehmir, A., Troll, V. R., Dehghannejad, M., Juhlin, C., & Ask, M., 2013. Scientific Reports, 3, 1677.

Burchardt, S., Troll, V. R., Mathieu, L., Emeleus, H. C., & Donaldson, C. H., 2013. Scientific Reports, 3, 2891.

Eckermann, H. v. 1948., Sveriges Geologiska Undersökning Ser. Ca 36, 176 pp.

Kresten, P., 1980., Lithos, 13, 153-158.

Stutzer, O., 1907., Naturwissenschaftliche Wochenschrift. Neue Folge IV, 25, 392-393.