

900 Ma Pole for Southwestern Baltica: Paleomagnetism of the Bjerkreim Sokndal Layered Intrusion, Rogaland Igneous Complex, Norway

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Abstract: The Rogaland Igneous Complex (RIC) in southern Norway intruded into post-Sveconorwegian granulite facies crust between 930 and 920 Ma. It includes three massif anorthosites, several small leuconorite bodies and the ~7km thick norite-quartz mangerite layered Bjerkreim-Sokndal (BKS) intrusion. The intrusion consists of five rhythmic mega-units created by repeated magma influxes topped by a transition zone and more evolved mangerites and quartz mangerites. Over 70 paleomagnetic sites have been collected in the BKS, sampling all the mega-cyclic subunits and overlying mangerites. Remanence within the BKS is held in hemo-ilmenite-only rocks (lower parts of the mega-cyclic units), mixed hemo-ilmenite and magnetite rocks (upper parts of the lower mega-cyclic units) and magnetite only rocks in the upper highest mega-cyclic unit and overlying mangerites. Due to the different oxides present magnetic susceptibility varies over four orders of magnitude with a bimodal distribution (mean susceptibility of 6.4×10^{-3} SI for hemo-ilmenite rocks, and 8.9×10^{-2} SI for magnetite rocks). NRM values do not show a strong bimodal distribution as many of the rocks lacking magnetite have hemo-ilmenite with strong lamellar magnetism; average NRM for the entire suite is 8.83 A/m. All sites within the cyclic part of the intrusion have stable remanence and produce well-clustered site means. Samples from the upper mangerite rocks, dominated by MD magnetite, are often unstable and not all sites provide acceptable data. Mean directions for 66 sites spanning the entire intrusion are $I = -73.7^\circ$, $D = 303.7^\circ$, with $\alpha_{95} = 3.6^\circ$ and $k = 24$. The resulting pole position is at 36.1°S and 217.5°E , with a paleolatitude for this part of Baltica of -59.7° . Examination of the magnetic mineralogy combined with geochronology for RIC rocks yields an age of magnetization of ~900 Ma. Metamorphic country rocks yield similar directions at least 10 km from the contact, confirming the presence of a contact aureole around the intrusion. Comparison to other early Neoproterozoic paleomagnetic poles from southern Scandinavia confirms the high southern latitude position of Baltica at this time, and combined with other ~900 Ma poles from Laurentia affirm the presence of the Rodinia supercontinent at this time.

Keywords: Paleomagnetic poles, lamellar magnetism, layered intrusions, Baltica, Neoproterozoic