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Evidences for Neogene-Quaternary tectonics in Svalbard

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Svalbard locates along the De Geer Transform Fault that separates the kinematics of North Atlantic and Arctic Ocean and are a continental rise along the North Atlantic portion of this transform. A fold and thrust belt of Paleogene age boards the Western margin of the Spitsbergen with a NNW-SSE trend. In the '60s the West – Spitsbergen fold and trust belt was related to the relative movements between Laurentia and Eurasia. Specifically, it was regarded to be a transpressive orogen developed at the intra-continental De Geer Transform margin between the Barents and the Greenland Shelves. This setting was suggested by the necessity of a continental transform off the western margin of Svalbard needed to restore the relative openings of the North Atlantic-Arctic Ocean basins, and the Paleogene age of the fold-belt. Later structural studies in other areas of Svalbard suggested that convergent tectonics have been prevailing during much of the fold and thrust development. However this belt can hardly be regarded as a classical orogen resulting from an active continental margin for the lack of evidence for subduction, synorogenic magmatism, metamorphism or a thickened crust. On the other hand, it would be difficult to merely relate this fold and thrust belt to the De Geer Transform Fault. According to Authors a transform fault should produce structures with vergence away from the fault on both sides, whereas the found direction of tectonic transport in North Greenland is the same as in Spitsbergen, i.e. to the E and NE. In this way the transform separation of North-Greenland and Spitsbergen should postdate the formation of the Tertiary North-Greenland and Spitsbergen fold and trust belt. This rises the question on possible Neogene-Quaternary tectonics in Spitsbergen. Evidence for this younger tectonics includes the occurrence of Quaternary volcanism and thermal springs in the northern part of Spitsbergen and the moderate seismicity in Nordaustlandet. Other clues supporting a recent tectonics derive from the analysis of satellite images and air photos, including the glacier and fluvial drainage suggesting a strong tectonic control. Moreover some authors have found in Ny Alesund an uplift rate from GPS measurements higher than those predicted by postglacial rebound models, again suggesting a tectonic contribution. Preliminary results from field work in the Brogger peninsula confirmed the presence of Neogene-Quaternary tectonics. Marine terraces and fluvio-glacial deposits show several N-S elongated steps along the northern projection of N-S trending faults cutting the Meso-Cenozoic rocks. N-S trending faults have been systematically found in Devonian to Tertiary rocks. These faults are characterised by right-lateral, strike-slip movements and the presence of near surface to sub aerial mineralizations on their surfaces, including kinematic indicators. N-S faults with the same kinematics show the presence of deformed Quaternary clastic, unconsolidated deposits within their shear zones. All the found brittle deformation evidence are compatible with the kinematics of the recent activity of the De Geer Transform Fault.