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Topography of the Scoresbysund region, East Greenland: understanding the evolution by compiling observations and numerical analyses

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Detailed analysis of modern and paleo- topography of the Eastern Greenland is the main topic of this study. We attempt to bring together different sets of data and analyze the possible scenarios of evolution using numerical models. Combination of a global (stresses due to tectonics and gravity) and local (erosion, deposition, and isostatic adjustment) numerical models gives the opportunity to estimate the importance of possible mechanisms responsible for evolution of the area. Combined analysis of digital data of elevation/bathymetry, ice thickness, and Moho depth and geological observations allows us to distinguish five regional domains of the study area. From west to east: (1) the "Central Greenland depression" is topographically high only because it is covered by ice sheet; (2) the "East Greenland mountain chain" has elevation of 2.5-3.7 km, extends N-S to nearly 1000 km and is supported by distinct crustal roots; (3) The dramatic (+3 to -1.5 km) topography of the "Fjord Mountains" residing above a normal crustal thickness; (4) "Uplifted Marine Basins" with gently folded Late Paleozoic to Mesozoic marine and continental deposits which are uplifted up to 1.5 km elevation and reside above a normal crust; (5) the submerged continental shelf marked by an even thinner crust and covered by thick late Cenozoic deposits. Our numerical analysis shows that erosion alone cannot be responsible for high topography of the Fiord Mountains. We thus tested flexural isostasy model to understand if additional loading due to sediment deposition in the east and due to weight of ice sheet in the west can result in significant uplift of the Fiord Mountains. We also evaluate if the stresses induced by the gravitational potential gradients may result folding of the entire region and thus in local uplift of the Fiord Mountains. The analysis of the gravity-induced stresses includes the comparison of the numerical models performed for the both local and global scales, it is also requires the construction of different

gravitational potentials for continental and oceanic lithosphere.