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100 years of Antarctic tectonic cartography

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Earth science investigations became an important component of Antarctic research in the beginning of past century when the contest for the South Pole conquest inspired execution of several major continental expeditions. Scattered geological observations made during these field endeavors provided basis for the earliest simplistic tectonic models which remained practically unmodified until expansion of multinational Antarctic exploration that followed the signing of the Antarctic Treaty.

The first more detailed tectonic images of Antarctica were proposed in the 1960-s by Russian scientists based on reconnaissance examination of ancient basement outcrops of East Antarctica and synthesizing the results of these studies with geological data obtained by other countries. The Russian tectonic approach was at that time deeply rooted in the achievements of geosyncline-platform theory, and the discussion was largely focused on the history of crystalline basement of the East Antarctic platform, and on the position of the boundary between the platform and its Pacific fold rim. One of the major stumbling points was the tectonic classification of the Transantarctic Mountains characterized by combination of Pacific affinities of the fold structures with the presence of Gondwanian-type platform cover.

The beginning of the 1970-s decade was marked by the appearance of plate tectonic models first published by the US scientists. Their earliest examples presented the gross tectonic structure of Antarctica as the consequence of successive Phanerozoic subduction-related processes and/or terrain accretion episodes at the Pacific active margin of the Precambrian East Antarctica. In this interpretation the Pacific nature of the Transantarctic Fold Belt received a geodynamic explanation, and its definition in some of the earlier schemes as part of the East Antarctic Platform was finally abandoned.

A new incentive to Antarctic tectonic compilations was given in the end of the 20th century by shift of the majority of field surveys to the sub-ice Antarctic interior (mainly the aeromagnetic mapping and radar-derived bedrock topography) and Circum-Antarctic marine areas (multichannel seismic profiling),

as well as by implementation of state-of-the-art isotope and geochemical methods for indoors analytical investigations of rock collections. Accumulation of massive new data on the morphology, potential field characteristics and crustal structure of both the subglacial interior of the continent and its submarine surroundings, as well as improved understanding of the age and structural relationships of geological units previously mapped on land, stimulated production of new maps and/or upgrading of the previously published editions and for the first time enabled expansion of Antarctic tectonic cartography beyond the limits of exposed areas of continental mainland. Several modernized compilations were accomplished in part as Antarctic components of CGMW global projects, and in part as national mapping initiatives or international Antarctic ventures endorsed by CGMW. These new products placed a much greater emphasis on geodynamic evolution of the entire Southern polar region of the Earth as the locus of Gondwana amalgamation and breakup.

The presentation displays a series of annotated sketches showing the major milestones in developing the Antarctic tectonic models during the century of Antarctic geological exploration.