Remote Sensing Analyses of Neotectonic Active Regions in East-Kamchatka *Vortrag*

Fabian Jähne[1] Ralf Freitag[1]

Introduction

The tectonic history of the Kamchatka Peninsula is dominated by continuous accumulation and amalgamation of terranes with different origins, which were delivered by convergence between the Pacific plate and in former times, the Kula plate against Eurasia (Freitag, 2002). The Kronotsky and Cape Kamchatka Peninsulas show that the collision of terranes and the resulting tectonics are still important for major parts of East-Kamchatka. While the collision of the Kronotsky Peninsula is sorely influenced by the convergence of the Pacific plate, the Cape Kamchatka Peninsula is affected by the collision of the Aleutian Arc with Kamchatka, what gives the opportunity to compare two different processes that resulted in the amalgamation of terranes to Kamchatka.

Data, analyse methods & object of work

In this work, neotectonic structures along the east coast of Kamchatka were analysed in detail. The study area includes the Kronotsky Peninsula, the Cape Kamchatka Peninsula and a part of the Kumroch Range that lies between them (Fig. 2). The available remote sensing data (Landsat TM7, ASTER, SRTM) were examined by the analysis of lineaments, terraces (Fig. 1), spectral properties and drainage networks all over the study areas. The analyse methods were chosen on the basis of their applicability to neotectonic structures and the available dataset. As no absolute ages of the terraces are available yet and because of the low resolution DEMs, only relative uplift could be determined for the study area. The result of all applied methods is a block-model of neotectonic active regions of eastern Kamchatka.

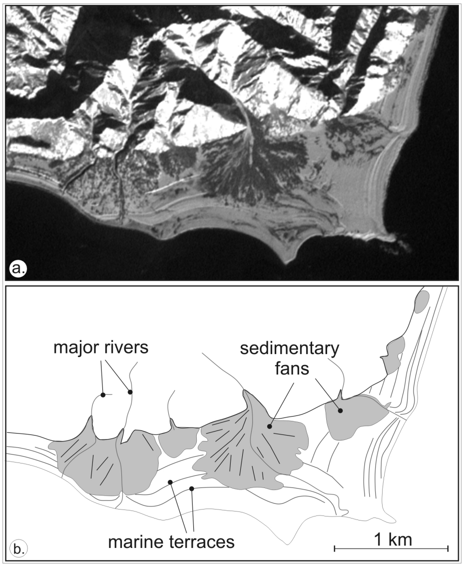

Figure 1: a.: detail image (Landsat TM7) of south-eastern Cape Kamchatka; b.: this interpretation of TM7 data show sedimentary fans which covers coastlines and marine terraces. (R. Freitag)

Results of remote sensing analysis

The results indicate that the Kronotsky and Cape Kamchatka Peninsulas are related to different neotectonic kinematics (Fig. 2). Both are also moving relatively to the Kumroch Range. But the applied analyses reveal that the style of deformation of the Kronotsky Peninsula has more similarities with the Kumroch

[1] Friedrich-Schiller-Universität Jena — Institut für Geowissenschaften, Burgweg 11, 07749 Jena

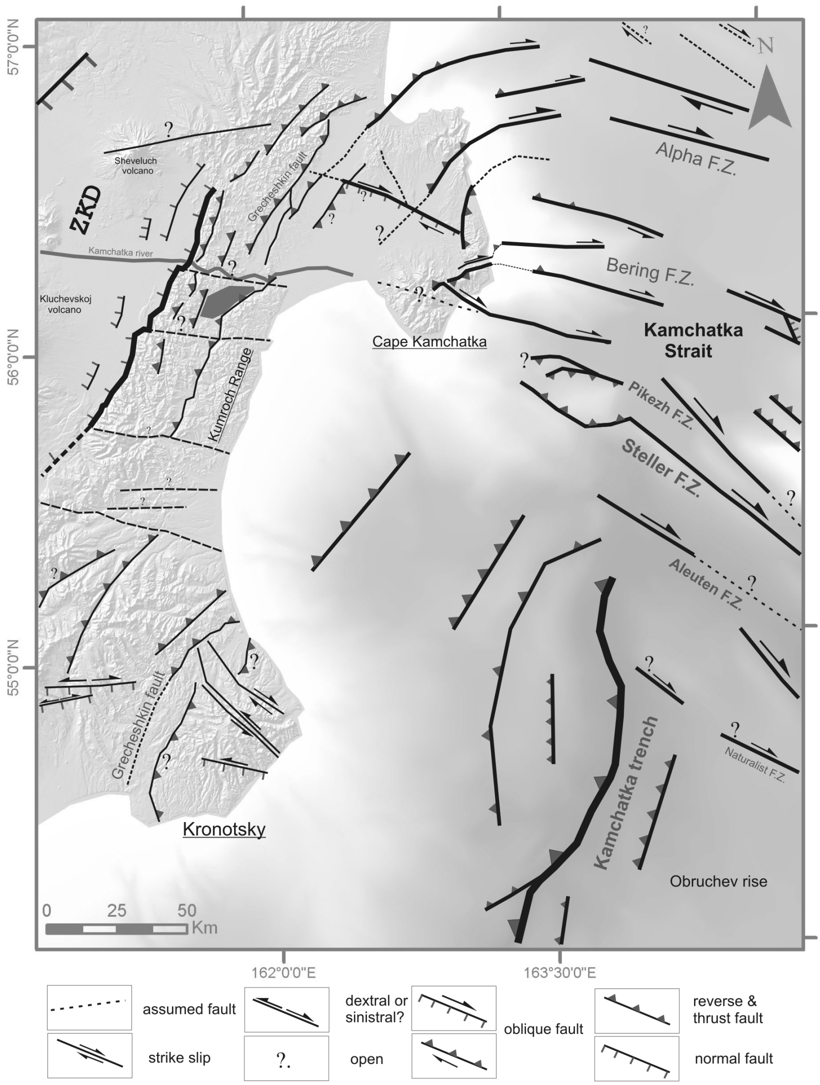

Figure 2: tectonic overview of eastern Kamchatka and the western Aleutian arc

Range as the Cape Kamchatka Peninsula.

The results of terrace analysis imply that the Cape Kamchatka Peninsula is divided into several small parts with different vertical movement. A major part of horizontal shortening on the Cape Kamchatka Peninsula seems to be relieved in differential rock uplift along the east coast. The lineament and terrace analysis clearly show a segmentation of the peninsula. This segmentation is mainly caused by the impact of the Komandorsky strike-slip zone, whose faults

form horsetail structures on Cape Kamchatka (Fig. 2). To the south of the peninsula the evidences for neotectonic activity increase. The southern part of the peninsula differs in topography, as well as in geology and the development of terraces from the northern and central parts of Cape Kamchatka. The neotectonics of Cape Kamchatka indicate that it can be associated to the Aleutian Arc.
The Kronotsky Peninsula seems to be less deformed by active tectonics than Cape Kamchatka. This Peninsula is probably uplifted en bloc. Several large thrust faults along the west side of the Peninsula indicate the collision of the Kronotsky-Terran with the accretionary wedge of East-Kamchatka (Fig. 2). The central part of the Kronotsky Peninsula is displaced to the NW along strike-slip faults and is interpreted to act as an 'indenter'. Young E–ENE striking lineaments which occur in Neogene volcanics (Railway Ridge) in the NW of Kronotsky are assumed to represent active dip-slip faults, which can be interpreted as Riedel shears with respect to the indenter. From this assumption an active diplacement of the indenter can be inferred.
The structure and uplift of the Kumroch Range (Fig. 2), between the Kronotsky and Cape Kamchatka Peninsulas, is interpreted to result from the subduction of the Pacific plate beneath East-Kamchatka. The Kumroch Range and the submarine accretionary wedge are dominated by NE-NNE striking thrust faults. From the analysis of terraces it is suggested that this part of the Kumroch Range is uplifted *en bloc.*

References

Freitag R, Gaedicke C, Baranov B & Tsukanov N (2001) Collisional processes at the junction of the Aleutian-Kamchatka arc: New evidence from fission track analysis and field observations. Terra Nova 13: 433-442

Freitag R (2002) Inselbogenentwicklung im Kamchatka — Aleuten Kreuzungsbereich. Dissertation, Scientific Technical Report STR02/09, GFZ Potsdam

Gaedicke C, Baranov B, Seliverstov N, Alexeiev D, Tsukanov N & Freitag R (2000) Structure of an active arc-continent collision area: the Aleutian-Kamchatka junction. Tectonophysics Vol. 325, 63-85

Jähne F (2005) Fernerkundliche Analyse neotektonisch aktiver Gebiete in Ostkamchatka. Diplomarbeit, FSU Jena, Institut für Geowissenschaften

Seliverstov N.I. (1998) Structure of the ocean floor around Kamchatka and geodynamic of the Kuril-Kamchatka / Aleutian junction area. Nautchny Mir, Moscow, (in Russian)