CERAMAH TEKNIK TECHNICAL TALK

SEDIMENTARY BASINS AND CONTINENTAL TOPOGRAPHY: AN INTERGRATED APPROACH

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Abstract: Continental topography and sedimentary basins are at the interface of deep Earth, surface and atmospheric processes. Sedimentary basins are mankind's largest resource of geo-energy (hydrocarbons and geothermal heat) and fresh water. Topography influences society, not only as a result of slow landscape changes but also in terms of how it impacts on geohazards and the environment. When sea-, lake- or ground-water levels rise, or land subsides, the risk of flooding increases, directly affecting the sustainability of local ecosystems and human habitats. On the other hand, declining water levels and uplifting land may lead to higher risk of erosion and desertification. In the recent past, catastrophic landslides and rock falls have caused heavy damage and numerous fatalities in Europe. Rapid population growth in river basins, coastal lowlands and mountainous regions and global warming, associated with increasingly frequent exceptional weather events, are likely to exacerbate the risk of flooding and devastating rock failures. Along active deformation zones, earthquakes and volcanic eruptions cause short-term and localized topography changes. These changes may present additional hazards, but at the same time permit, to quantify stress and strain accumulation, a key control for seismic and volcanic hazard assessment. Although natural processes and human activities cause geohazards and environmental changes, the relative contribution of the respective components is still poorly understood. That topography influences climate is known since the beginning of civilization, but it is only recently that we are able to model its effects in regions where good (paleo-) topographic and climatologic data are available.

The present state and behaviour of the Shallow Earth System is a consequence of processes operating on a wide range of time scales. These include the long-term effects of tectonic uplift, subsidence and the development of river systems, residual effects of the ice ages on crustal movement, natural climate and environmental changes over the last millennia and up to the present, and the powerful anthropogenic impacts of the last century. If we are to understand the present state of the Earth System, to predict its future and to engineer our use of it, this spectrum of processes, operating concurrently but on different time scales, needs to be better understood. The challenge to Geosciences is to describe the state of the system, to monitor its changes, to forecast its evolution and, in collaboration with others, to evaluate modes of its sustainable use by human society.

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