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Geometry of growth strata in a transpressive fold belt in field and analogue model: Gosau Group at Muttekopf, Northern Calcareous Alps, Austria

Hugo Ortner (1), Andreas Kositz (1), Ernst Willingshofer (2), and Dimitrios Sokoutis (2)

(1) Innsbruck University, Geology and Paleontology, Innsbruck, Austria (hugo.ortner@uibk.ac.at), (2) Amsterdam Free University, Faculty of Earth and Life Sciences, Amsterdam, The Netherlands

Growth strata have been studies extensively in cylindrical settings, where the geometry of clastic wedges on folds or normal faults is well known. We studied growth strata deposited in a setting of oblique convergence, that could be characterized as thrust-dominated transpression. The most important difference to orthogonal shortening or extension is the presence of tear faults creating a segmented depositional area.

The main focus of this study is to understand growth strata geometries around tear faults crossing an anticline-syncline system. Growth strata above a tear fault shows combined rotational offlap-onlap-overlap geometries, caused by changes in strike instead of changes in dip as seen in classic examples. The principal unconformity connects to the tear fault, which separates anticline segments with different wavelength and amplitude. Growth strata between high-angle tear faults display either rotational offlap or rotational overlap caused by changes in dip, as growth rates in neighbouring segments are different due to different anticline amplitudes.

We consider deposition in a basin in which dextral shearing and folding in the bedrock were contemporaneous with deposition. Fold limbs would be tilted and offset across the high-angle faults. Given some surface topography of the depositional system related to progressive tilting of fold limbs, dextral offset across high-angle faults are expected to create a slope sub-parallel to the fault, which then would be onlapped by younger strata. Due to progressive shearing this geometry may then be further enhanced by development of a trishear zone within the soft sediments. Therefore offlap-onlap-overlap patterns created by changes of strike document the synsedimentary activity of high-angle faults rather than folding. This hypothesis was confirmed by analogue modelling. Hence, we conclude that syn-tectonic sediments deposited above a tear fault developed a pronounced tri-shear zone between basin segments.