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Vertical-axis rotation: an intrinsic part of folding

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The process of surface-near, thin-skinned folding is usually considered as a tilt of layers, rotating around (sub)horizontal axes in response to shortening. In a folded area, dip directions of tilted layers will tend to be parallel to the convergence direction, however, there are also always layers whose dip directions are not parallel to convergence. Such layers will be incompatible to further shortening, and, when fold closure goes on, must somehow be adjusted to a progressively denser, more parallel packing of layers. Palaeomagnetic data indicate that such a "layer parallelisation" is done most probably by vertical-axis rotations. Rotations can achieve 30° and more, depending on the original orientation of a layer relative to the shortening direction. Layer parallelisation within a group of palaeomagnetic sites can be identified through the correlation of palaeomagnetic rotation with the orientation of the bedding poles relative to the overall shortening direction. As a consequence, we must distinguish two types of vertical-axis rotation in folded sequences: (1) small-scale differential rotations due to layer parallelisation during folding and (2) external, overall rotation ('block rotation'). To obtain the vertical-axis rotation which is significant for medium to large-scale tectonic processes like oroclinal bending, small-scale differential rotations within a folded sequence must be averaged out or shown to be non-existent. On any account, the vertical-axis rotation of a single or just a few sites out of a folded sequence cannot be looked upon as representative for the overall tectonic setting.