Using 3D geospatial modelling to investigate the 4D structural controls on the deposition of the Gosau deep water sedimentary basin, Northern Calcareous Alps, Austria

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The Gosau Group that crops out in the Northern Calcareous Alps in western Austria provides an exceptional setting to study the interaction of structural growth, stratigraphy and stratal architectures within the context of a deep water sedimentary basin. However, given that the basin is preserved within an Alpine thrust system the field area provides a challenging location to derive a 3D understanding of the basin using conventional mapping techniques. The aims of this project are to construct a 3D geospatial model of the basin and subsequently, using 3D Move integrated with an understanding of the basin fill, to provide a 4D understanding of the basin development.

The Gosau basin, which is approximately 10 km in length by 5 km in width, comprises a compressional southern margin that is fold dominated in the west and thrust controlled in the east. This change in structural style along the southern margin basin has a pronounced influence on the stratigraphy that is observed within the basin fill and provides a testable hypothesis as to how changes in structural style control facies architecture. Field exposure is largely limited to four cross-basin sections that have relief of approximately 1500 m. Although high resolution studies can be undertaken on each section it is difficult to extrapolate between sections. Only by using 3D visualization and modeling to correlate horizons is it possible to understand the 3D nature of the basin. This is overcome using DEMs draped with ortho-rectified aerial photographs on which key intervals can be correlated across the basin. Furthermore, having constrained these intervals using field data, 3D surfaces can be constructed. These surfaces are then used in 2D/3D Move restorations. This has proved to be a very powerful tool in developing multiple models of basin configuration given the available data and thereby enabling us to consider uncertainty in the models. In particular the iteration between surface construction and restoration is invaluable to the generation of a consistent and geological viable model. By constructing these surfaces

within Gocad it is then possible to generate volumes that characterise observed variations within basin fill facies.

The ultimate objective is to generate a 4D geospatial model of the basin evolution from which we can investigate the influence of varying styles of tectonic deformation on sedimentology and stratal architectures.