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Structural Evolution of an Intra-arc Basin, Example of the Neogene Northern Fossa Magna Basin, Central Japan

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Analogue models performed in this work aimed to simulate the development of the Northern Fossa Magna (NFM) basin and to better understand the geometry of the active faults systems transecting this area. These scaled models allowed us to visualize the development of the geological structures from the opening of the basin, through the filling up and finally the closure of the basin with uplift during the tectonic inversion. Three experiments were performed with respect to the scaling model conventions. This gave us insights into explaining of what we consider to be lack of certain members in the stratigraphical column as well as for the thickness variation of the Neogene strata, which characterize this area. The NFM basin has been strongly controlled by major normal faults related to the master detachment fault (pre-ISTL) during Miocene and Pliocene, which was observed in sandbox experiments during the extension.

Understanding the geological process that created the NFM basin and the geometry of the fault system surrounding this basin is of great importance. Effectively two faults bounding the study area are considered among the major active faults in central Japan; the Itoigawa-Shizuoka Tectonic Line active fault system and The Western Nagano Basin Fault. During the compression of the sandbox, a pup structure of the NFM was developed in all experiments directed at initial stage of the tectonic inversion by reactivation of the preexistent normal faults. At a later stage of the compression, new reverse faults occurred out of the basin in this basement. Their displacement accommodated a large part of the compressive stress. A latest thrusting fault dipping 35 degree occurred

at about 7 km depth down east and propagates upward toward the west and emerged at similar location of the ISTL. During the experiment, a large amount of the stress seemed to concentrate underneath the basin at a depth of 4.5 to 7 cm in the scaled model, which is equivalent to 9-14 km in the natural prototype beneath the center of the basin. This fits well with the depth of the hypocenter of the seismic activity known in this region (10-14 km).