The Plinian eruption of Somma-Vesuvius volcanic complex AD 79, which completely buried the Roman settlements of Pompeii and Herculaneum belongs to the most well-known eruptions in history. During this eruption almost the entire Sarno River plain was covered by volcanic deposits (Sigurdsson et al., 1985) showing a specific and therefore easily identifiable stratigraphy (Fig. 1). Thus, these deposits can be considered as an ideal chronistratigraphic marker.

The eruption AD 79 covered the Sarno River plain with volcanic deposits of some meters. This not only caused a caesura in the existence of an entire landscape, but also contributed to the excellent preservation of the paleo-surface and the ancient paleo-environmental conditions before the eruption of AD 79 (Foss et al., 2002). Consequently, almost 2,000 years later, this paleo-surface is still accessible for stratigraphical investigations.

The objective of this research project is to reconstruct the paleo-topography and paleo-environmental features of the Sarno River plain before the eruption of Somma-Vesuvius in AD 79. The objective is based on the hypothesis that the eruption caused a coating of the ancient topography which left ancient physiographic elements still recognizable in the present-day topography. The utilized methodology combines stratigraphical information from core drillings, present-day topographical data, and classification and regression methods.

Methodology
To reconstruct the pre-AD 79 topography and paleo-environmental conditions more than 1,800 drillings from construction works, as well as from past archaeological and geological studies, were collected to gain a representative network of stratigraphical information for the entire Sarno River plain (Fig. 1). By means of the drilling cores the stratigraphy was determined, the volcanic deposits of AD 79 and the pre-AD 79 surface underneath were identified, and the pre-AD 79 stratum was characterized. We reconstruct the pre-AD 79 topography with a sophisticated geostatistical methodology based on a present-day high-resolution digital elevation model (DEM) and a classification and regression tree approach.

Results & discussion
Fig. 3 illustrates the modeled depth to the pre-AD 79 surface of the Sarno River plain. It ranges from >0 to 15 m whereas the average depth is 5.7 m. The distinct spatial distribution of volcanic deposits since AD 79 is most notably controlled by two sets of processes: (i) the initial deposition during the eruption and (ii) the subsequent redistribution by processes of erosion and transport. Originating from the vent of Somma-Vesuvius, the pumice lapilli fallout was dispersed concentrically towards the southeast resulting in thickest deposits on its southeastern flanks, near the source of the eruption.

Outlook
In future studies this pre-AD 79 DEM will be used to identify potential locations of Pompeii’s marine or fluvial harbor, whose exact location is still debated. Moreover, the combination of the pre-AD 79 DEM with archaeological findings enhances the paleo-environmental reconstruction of the Sarno River plain. In the next project phase the pre-AD 79 DEM will be used to determine the paleo-topographic setting of the known ‘viliae rusticae’ of the Sarno River plain. In addition to paleo-pedological analyses, we will use the pre-AD 79 topography to reconstruct soil and land use characteristics and to simulate the ancient cultural landscape of the Sarno River plain.

References