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The European Alps sensed by GOCE

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The observations of the GOCE satellite in western Europe give a major contribution over mountain ranges and in the transition zone between ocean and continent. The area centered on the Alpine arc highlights the improvement, three mountain ranges meeting here, the Alps, the Dinarides, and the Appennines, and there being the continent-ocean transition to the Tyrrhenian Sea. The gravity observations of GOCE produce an unparalleled global field that allows to detect geological features and classify types of continental crust. GOCE is superior to existing global fields based on terrestrial data, as is EGM2008, as is seen from the regional variability of the root mean square difference between the two fields. The difference is governed by which is biased by varying quality of the terrestrial observations. The gravity anomaly and Bouguer fields of GOCE and residual fields based on a regression between topography and gravity are studied. The root mean square amplitude variation of the residual Bouguer field is reduced by 56%, demonstrating that the regression efficiently eliminates the isostatic field. As expected, for the gravity anomaly the reduction is less and amounts to 20%. The residual fields highlight geological units, as deep sedimentary basins (Po-basin sediments, Alpine foreland basin), the Ivrea body and the Periadriatic intrusions, and the gravity high centered on the Tuscan Arcipelagus connecting Western Corsica and the Tuscan geothermal fields. The transition of the Alpine Arc towards the Pannonian basin is marked by two subparallel NS striking positive anomalies separated by a negative linear anomaly. The observation of these anomalies is new and is important in modeling the Alps eastern transition. I demonstrates the strength of GOCE in mapping the field homogeneously crossing geologic, orographic and national boundaries.