

## **Trend analysis of surface longwave and shortwave radiation over Europe**

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The results of a detailed trend analysis of surface longwave and shortwave radiation over Europe are presented on a basis of data from the ISCCP project (International Satellite Climatology Cloud Project). The ISCCP FD SRF dataset includes spatially and temporally homogenized up-welling and down-welling longwave (LW = 5.0-200.0 microns) and shortwave (SW = 0.2-5.0 microns) radiation estimates coming from the synergistic use of satellite data and models. The area of interest, Europe, consists of equal area grids with a spatial resolution of equatorial 2.5x2.5 degrees (280 km<sup>2</sup>). The temporal resolution of the data is 3 hours while the dataset spans from January 1984 to December 2007. In order to study the long-term variations of the longwave and shortwave radiation, monthly mean values of the above mentioned period were considered. A statistical analysis is applied to derive trends and seasonal variability for this time period over Europe. To fit the time series, a model with a linear trend and a seasonal component for the annual cycle of radiation has been used. The seasonal component is estimated by a harmonic analysis. The significance of the longwave and shortwave radiation trend is also determined. As it is shown here, the observed trends and their significance are rather variable for different areas in Europe.

## **Mantle source characteristics of Late Miocene-Pleistocene alkaline basalts, western Pannonian Basin, Austria**

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Late Miocene-Pleistocene alkaline mafic magmas were erupted in the Carpathian-Pannonian Region following the Eocene to Miocene subduction-related calc-alkaline volcanism. The lavas range from hy-normative basalts through alkali olivine basalts and basanites to nephelinites.

The majority of basaltic lavas are fresh, olivine-phyric and holocrystalline, whereas olivine is coupled by clinopyroxene phenocrysts in some samples. The olivine phenocrysts contain occasionally spinel inclusions. The matrix consists of plagioclase, clinopyroxene and olivine along with titanomagnetite, ilmenite, and apatite. Phlogopite, interstitial alkali feldspar, nepheline and leucite also occur in some of the lavas. In contrast, nephelinites are rich in clinopyroxene and nepheline and contain titanomagnetite in the groundmass along with subordinate amounts of olivine, apatite and leucite.

Olivines mg-numbers vary between 88-66. They are generally zoned and began to crystallize with Fo around 87 and 79. In the course of crystallization Fo decreases to 84-66 at the rims of phenocrysts being similar to Fo in the groundmass. The NiO of the olivines decreases with decreasing MgO content, while CaO and MnO increase.

Clinopyroxene compositions range from augite to diopside. They exhibit both oscillatory and sector zoning as a result of disequilibrium crystallization. The compositional difference between cores and rims follow the normal pyroxene fractionation trend; the cores are richer in Mg, Si and Cr and poorer in Fe, Mn and Ti than the rims. The majority of the clinopyroxenes have Al<sup>VI</sup>/Al<sup>IV</sup> (0.0-0.65) typical for low pressure clinopyroxene and support shallow level crystallization.

Most alkali basalt corresponds to the criteria for primitive rocks having high mg-number (>0.62), high MgO (>9 wt. %) and high Ni (>192 ppm) and Cr (>286 ppm). These

magmas underwent only minor olivine±clinopyroxene±spinel fractionation and apparently approach a primary melt composition.

The silica saturation index (vary from -59 to +2) and trace element ratios ( $La_N/Yb_N=11-31$ ) generally suggest that these lavas have experienced different degrees of partial melting. The hy-normative basalts of Oberpullendorf have the highest degree of melting while Stradnerkogel nephelinites have the lowest. Those rocks that formed via a low degree of melting possess high Zr/Hf ratios (60-66), and negative K and Ti anomalies similar to those of carbonatites. All studied rock varieties have high Nb/La ratios (>1) suggesting OIB-like asthenospheric mantle source. The absence of LILE enrichments (K, Rb and Ba) indicating no interaction with fluids possibly derived from subducted slab. The steep REE patterns and the high  $D_{Y_N/Yb_N}$  ratio (average 1.8) strongly suggest that garnet was a residual phase during the partial melting in the source region.

The  $^{87}Sr/^{86}Sr$  isotopic compositions of the studied lavas are low (0.703505-0.704279), and the  $^{143}Nd/^{144}Nd$  ratios are high (0.512736-0.512858). Thus, they are isotopic depleted relative to the bulk Earth and similar to HIMU-OIB. Moreover, they are similar to those of Romanian basalts and Neogene alkali basalts throughout Europe.

## **Petrographic characteristics of some Middle Triassic volcanic and volcanoclastic rocks in the External Dinarides (Croatia and Bosnia and Herzegovina)**

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In the geotectonic unit of the External Dinarides, several volcanoclastic-sedimentary successions of Middle Triassic age have been investigated from outcrops in Croatia (in the vicinity of Sinj and Knin) and in Bosnia and Herzegovina (in the vicinity of Bosansko Grahovo). The appearance of volcanic and volcanoclastic rocks in the External Dinarides have usually been interpreted as the Middle Triassic syn-rift phase in which graben-like depressions had been formed along deep structural fractures. The Middle Triassic rift phase in the External Dinarides is marked by volcanic activity that had been defined as basaltic extrusions at the beginning and more acidic explosive activity that characterised deposition of thick pyroclastic and volcanoclastic successions in the later phases. Volcanic and volcanoclastic successions near Sinj have been described mineralogically and petrographically by the same authors and interpreted as vitric to crystal tuffs and ignimbrites deposited as pyroclastic flows in intrashelf environment, not far from a subaerially located caldera.

In our investigation we examined several lithotypes of volcanic and volcanoclastic rocks not previously described. Near Bosansko Grahovo there are occurrences of blocky pepperites. In the angular pepperite type jigsaw-fit texture can be observed suggesting quenching of Mg-depleted basaltic lava on the contacts with unconsolidated pelagic limestones. The Ladinian age of the succession was determined on the basis of conodonts found in limestones intercalations.

Near Sinj a thick volcanoclastic beds (called “pietra verde”) are interbedded with marine bioclastic, well bedded limestones, cherts and dolomites. Bioclastic limestone and dolomites are characterised by an abundance of calcareous algae, foraminifers, gastropods, bivalves, brachiopods, crinoids, serpulids as well as radiolarians, ammonoids and conodonts, the latter suggesting open marine (pelagic) associations. Limestone beds are strongly silicified and recrystallised. Dolomites exhibit macrocrystalline anhedral texture suggesting a secondary dolomitisation. Lower Ladinian age was inferred on the basis of conodonts and ammonoids.

Volcanoclastic beds (tuffs) near Sinj are massive or evenly laminated. Cross lamination occurs at the top of some beds. Several volcanoclastic lithotypes (tuffs) do not significantly differ in composition. They contain predominant former glassy fragments which are cusped,