

## **Sensitivity study of a local numerical fog prediction system**

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Accurate and reliable information on expected visibility conditions at the airport of Thessaloniki-Greece, is of high importance, concerning safety and operational expenses for the airport and the airway companies. On the other hand, the life cycle of fog involves complex interactions among dynamical, turbulent, microphysical and radiative processes that are still not fully understood. Therefore, the implementation of a numerical fog simulation-prediction model could be a very helpful tool, for understanding in depth the physical processes involved in the different stages of fog formation and consequently to accurately forecast fog conditions.

The main objective of this effort is to investigate and address the sensitivity of the one dimensional COBEL-ISBA (COuche Brouillard Eau Liquide - Interactions Soil Biosphere Atmosphere) local model to different microphysics, planetary boundary layer and surface schemes of the WRF-ARW regional non-hydrostatic atmospheric model at the “Macedonia” airport of Thessaloniki. High-resolution numerical experiments regarding the fog event that was formed on the 6<sup>th</sup> January 2010 at the airport were performed with the latest version 3.2 of the WRF-ARW regional atmospheric model. The fog was quite thick, with estimated minimum visibility reaching 100 m and it was extended to an area covering the whole airport and the surroundings, that is up to a radius of 5 km. This fog event persisted for about 8 hours. Different combinations of the Mellor-Yamada Nakanishi-Niino (2.5 level) TKE and the Bougeault and Lacarrere TKE boundary layer schemes with microphysics schemes and the Monin-Obukhov (Jannjic Eta) and Mellor-Yamada Nakanishi-Niino surface-layer schemes, have been investigated in order to assess the predictability and the overall performance of the COBEL-ISBA model. The numerical results, regarding meteorological parameters, such as, air temperature, relative humidity and horizontal visibility, have been compared with actual measurements and the findings, have been evaluated and discussed.

This work describes and evaluates an ensemble approach, which is designed to quantify the sensitivity of COBEL-ISBA model to different physical parameterizations of the WRF-ARW model at the airport of Thessaloniki.

## **Geochemical characteristics of the amphibolites (ophiolitic metabasites) from the Serifos metamorphic core complex, Attic-cycladic metamorphic belt, Cyclades, Greece**

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Half of the surface outcrop of the Serifos island (NW Cyclades, Attic-Cycladic Metamorphic Belt) is composed of a volcano-sedimentary sequence regionally metamorphosed to greenschists facies. This unit consists of, mainly carbonate-rich metasediments, alternating with silicate-rich layers with chlorite and mica-rich layers and enclose a wide variety of metabasites: amphibolite blocks and mafic schists (with minor relict blueschists facies assemblages, now retrogressed to greenschists). The origin of the amphibolites (ophiolitic metabasites) within the Attic-Cycladic Metamorphic Complex (ACMC) remains enigmatic due to the disrupted occurrence of these rocks that makes difficult to constrain the structural relationship of these rocks with their host rocks and their tectonic significance. This study documents preliminary geochemical data (major-and trace elements) of the amphibolites interlayered within the Serifos Greenschist Unit. A comparative geochemical study of these rocks with other meta-ophiolite rocks from similar structural occurrences in other Cycladic islands, is attempted. On the basis of petrographic and major - trace element

bulk chemical data, these rocks can be distinguished in different rock types (basalts/andesites and minor gabbros) with different chemical affinities: a) The relatively LILE-enriched amphibolites resemble typical low- to medium – K calc-alkaline basalts (CAB), comparable to the recent Aegean back-arc volcanics. b) Other amphibolites display chemical affinities similar to island arc tholeiites (IAT). c) The retrogressed blueschist – to –greenschists facies metabasites are coarse-grained gabbroic rocks with mixed IAT/MORB chemical affinities. Further geochemical work need to be carried out in order to improve our knowledge on the tectonic setting and emplacement of the Serifos amphibolites.

## **Gemmological examination of 3 jewellery objects from the Veliki Preslav treasure in Bulgaria**

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In August 2009, by a special permission from the director of the Veliki Preslav Museum it was possible to examine 11 jewellery objects of the Preslav treasure. Between the late 9th and the early 10th century, Preslav was the capital of the great Bulgarian empire, in 971 it was devastated by the wars between Sviatoslav from Kiev and the Byzantine emperor John I Tzimiskes. In spring 1978, a treasure was discovered near the former Preslav royal palace, after farmers had been ploughing into a depth of 0.60-0.70m the winter before. The treasure box had probably been hidden since 971 in an old dwelling. The jewellery objects shows a distinct Byzantine influence but may have been produced in local workshops under Byzantine masters.

Standard gemmological equipment was used for the testing procedures. Results relating to three gold medaillons, two round ones (5cm in diameter) and one rhomb-shaped (6.5x6cm) will be described. A total of 30 drilled emeralds of hexagonal prismatic shapes with polished surfaces was examined, measuring between 0.20 to 0.60mm in length and 0.40 – to 0.72cm in width and showing a pale to intense green colour. 13 of otherwise non-transparent emeralds have translucent to small transparent areas that allow to observe mica platelets, tremolite needles and small negative crystals (two-phase inclusions) under the microscope (30x-120x). The inclusion pictures observed would correspond with what could be expected of emeralds that were formed by pneumatolytic contact metamorphism.

The European emerald deposits in Upper Egypt and the Austrian Habachtal do both belong to this basic type of formation and are discussed as possible sources of origin. Examples of comparable emerald crystals in –Roman and early medieval jewellery, observed by the authors in museums in Sofia, Cairo, Alexandria and Aachen, are discussed as are other possible worldwide sources of origin. As they were discovered at a later date (Colombia in 1514, Ural in 1830 and all others in the 20th century), the question remains if the deposit in the Hindukusch area of Afghanistan, mentioned by Theophrastus in 314BC, might be a possible source although there are no further written sources and there is no evidence of mining between the 4th century BC and the 1970s when the deposit was rediscovered by the Soviet occupation. Pliny's reference to Scythian emeralds is discussed and compared with Scythian jewellery objects.

24 pearls in barrel and button shapes, measuring between 0.35 and 48cm, were examined; their light to dark grey colour is interpreted as the result of environmental influence. Pearl surfaces show moderate to distinct signs of dissolution. They are most certainly of marine origin and do probably come from classical finding places like the Persian Gulf, the Red Sea or the Strait of Manaar between India and Sri Lanka.

11 drilled purple gemstones or irregular polished shapes, in a size range of 0.55-0.68 cm, were identified as 10 purple sapphires and 1 garnet. They had before been described as amethysts. The possible origin in Sri Lanka is discussed.