T2EΔK-00350- Development of Autonomous Atmospheric Recorder of Electrical Field for Ships

Marine weather forecast, especially for overseas voyages, relies nowadays on sophisticated numerical prediction models based on observations collected from weather stations and balloons, radar and satellites. The low resolution though of such means (ranging from tens up to hundreds of kilometers) results in reduced accuracy and increased uncertainty, limiting the prediction to narrow short-term time intervals. A question is then raised on how good-quality observation data can be gathered over the data-sparse oceans and extended sea areas or for predicting the weather in the immediate following hours. Thus, the marine environment still constitutes a challenge because it does require in-situ measurements for the calibration and validation of the predicted data which are lacking due to the difficulty of installing permanent weather stations at seas. This can be addressed however by exploiting the huge number of commercial vessels, sparse all over the world navigating everyday, so that in-situ measurements can be made possible. On the other hand, as the atmosphere is an electrically conductive medium, the presence of clouds and thunderstorms creates static electric fields with an intensity varying between few tens of V/m (on clear weather at sea level) up to thousands V/m during storms. In contrast to the atmospheric pressure or the wind which are rapidly changing, the atmospheric static electric fields depend only on the distance of the measuring station (ship) from the source of the electric charge (cloud). They can therefore act as the most credible factor of weather predictions, increasing their accuracy and the time-window of the forecasts. The detection of the electric field fluctuations enables the assessment of the measured variations in the atmospheric pressure, temperature and humidity and thus making possible to collect in-situ measurements leading to improved predictions at local level and for the next few hours. Based on the above, EFOS project aims at the design, development, pilot implementation and evaluation of an innovative reliable low-cost portable and energy-autonomous system, to be installed and operated on-board for the measurement of the atmospheric static electric fields. The measured data will be used in combination with data collected from the ship's anemometer and from additional sensors of atmospheric pressure, temperature and humidity, to reliably predict the weather conditions at sea environment. The system will be installed on commercial vessels navigating overseas and will be energy-autonomous through an efficient power management unit based on renewable sources and implementing the triboelectric and thermoelectric phenomena. These key innovations introduced by EFOS will lead to further enhancement of marine weather observations at seas and accurate forecasting at local level and with low response time. The

EFOS system will also include a processing unit accompanied with wireless transmission of the measurement data, through the "METIS ship telematics system", for their recording, analysis and evaluation. By this way, a large pool of reliable behavioral measurement data will be created which will be continuously enriched by further installations on a growing number of vessels, forming the baseline for their future incorporation and comparison with the existing numerical models of weather forecasting. EFOS project is based on pioneering interdisciplinary research establishing synergies between corporate and academic partners. Such technical development initiatives will eventually lead to the creation of new patents and of a unique competitive advantage for the Greek and international markets tracing a large business opportunity. As this knowledge-intensive initiative introduces new applications, it enables boosting the business development of added-value products and services for a successful penetration into the international maritime and wider market of reliable weather forecasts.

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