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MARINE CONDITIONS AND THEIR SIGNIFICANCE FOR THE DESIGN OF SCIENTIFIC DINVING OPERATIONS

G. Kalantzi[1], K. Papadimitriou[2]

[1]Aristotle University of Thessaloniki, School of Rural Surveying Engineering (Thessaloniki 541 24, Greece; gkalantzi@hotmail.com),
[2] Aristotle University of Thessaloniki, School of Rural Surveying Engineering (Thessaloniki 541 24, Greece; paki@auth.gr).

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ABSTRACT

Currently, the planning of diving operations, including scientific diving, when it comes to expected marine weather conditions is based mostly on generic weather bulletins, observations and experience from the involved stakeholders. However, it is known that weather is unpredictable and can be a factor of misplanning in the best case scenario or safety incidents, in the worst. In this work we aim to highlight the importance of knowledge of future marine weather conditions when planning scientific diving operations. These activities demand precision in their post-operation design, so as to secure best possible outcome of the research, experiment, sampling, mapping etc, as well as to ensure safety of the divers and their equipment. More specifically, knowledge of future conditions at sea plays a crucial role for (a) the planning/ design of the underwater research (i.e. site assessment, description of conditions, evaluation of risks, “smart” mission planning, optimum conditions-based planning), (b) the scientific diving methods (i.e. ground trothing, weather/ sea state model calibration, monitoring of conditions), and (c) the related technology (i.e. web services. Dive computers, other sensors such as monitoring buoys, remote sensors such as satellites). Marine weather parameters that are useful to be known prior to planning of scientific diving operations are the wind, the wave, the currents, the sea temperature, the air temperature, the tides and others. For some of them such as the currents and the sea temperature it is useful to know their future values on the sea surface but also in various depths. Nevertheless, there are several sources of this information, several forecast models and several data provision types. These are all notions that will be overviewed in the present work, as well as options regarding the optimum sources and formats of information. Finally, the accuracy of existing numerical forecasts models will be commented on and state-of-the-art alternatives that are gaining ground nowadays will also be mentioned. These include new and disruptive Artificial Intelligence models that by using good quality reanalysis data that are already available, can actually “learn” how ocean physics works and can provide marine weather forecasts of enhanced accuracy and spatial/ temporal resolution. This game-changing accuracy can benefit several

operations within the maritime industry such as transportation, fishing etc but can also find ground in the planning of high-demand operations such as the scientific diving operations.