Remote Sensing of the European Seas

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To Enheduanna
Daughter of Sargon of Akkad
High Priestess of the Moon God Nanna

Contents

Preface

Princess Enheduanna, daughter of king Sargon of Akkad, lived around 2300 BC. She was a high priestess of the moon god Nanna in the ancient city of Ur. And an accomplished poet too. In fact, she is the author of a number of Sumerian hymns, and is generally considered to be the earliest author known by name. When she came to honor Inanna – the goddess of sexual love, fertility, and warfare, daughter of Nanna and often associated with the planet Venus (the one that the Akkadians called Ishtar) – above all the other gods of the Sumerian pantheon, she mentioned for the very first time, in her Hymn number 8, nothing less than the "Seven Seas"...

Septem Maria, would call them the Romans centuries later, after inheriting the concept from the Greeks (for whom seven probably just meant several), but perhaps applying it to the wrong place – *i.e.* the extensive system of coastal lagoons, which at the time dotted the northern Adriatic Sea – at least in the description of Pliny the Elder, Roman fleet commander and scholarly author of *Historia Naturalis*. Indeed, which seven seas are intended depends on the context. According to the historians, there are at least nine bodies of water in the medieval European and Arabic literature that can aspire to qualify as one of the famous seven. And, as suggested in poetry by British author Rudyard Kipling, there are seven oceans on planet Earth, if one counts after separating into North and South both the Pacific Ocean and the Atlantic Ocean. But here, in this Volume devoted to the European Seas, the seven mythical basins are those that surround the European continental landmass. Maybe they are not even seven, at a careful account, but they are certainly several and, just as certainly, they display a wide range of environmental traits.

Studying and understanding the natural history of these modern Seven Seas requires integrated observation systems, which must include up-to-date remote sensing techniques. This Volume reviews the current potential of Earth Observations, while devoting particular attention to those applications that deal with the issues, peculiarities and special challenges posed by the European marginal, semi-enclosed and enclosed seas. The assessment of surface parameters by means of both passive and active techniques – measuring reflected visible and near-infrared sunlight, or surface emissions at thermal infrared or microwave frequencies, or again the return of transmitted impulses of visible or microwave radiation – is addressed in a collection of topical papers. Satellite remote sensing from Earth's orbit is the focus of most of them, but selected, promising examples of airborne measurements and ground-based applications are also covered. The review

of the most recent results achieved by each of these techniques, and of the new scientific ground broken by them, provides an unprecedented insight into the inimitable mix of dynamical and bio-geo-chemical features that characterize the European Seas.

The peer-reviewed papers collected in this Volume – which targets researchers working in the field of Earth and Marine Sciences, but also teachers, as well as (graduate) students, in the same field – are organized into four main sections. The first provides a brief overview of the European Seas, followed by an historical outlook on the development of the remote sensing approach to marine environmental issues in Europe. The second part is devoted to Visible & Thermal Infrared (passive and active) remote sensing, and the third to Microwave (passive and active) remote sensing. The fourth offers a few examples of multi-sensor techniques, which are becoming increasingly useful to exploit the synergies of complementary sensors and to enhance the value of their combined views.

The breath of the environmental themes covered, and of the diverse techniques dealt with, called for the contribution of the entire European marine remote sensing community. Not surprisingly, then, very many scientists helped, either as authors or as reviewers, sometimes as both, in the realization of this Volume. Their names and affiliations are recalled in the "contributors" list that follows. Sincere thanks are due to all.

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