

Geoinformatics for Marine and Coastal Management

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Chapter 4: Recent developments in remote sensing for coastal and marine applications

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ABSTRACT:

The coast is the dynamic interface between land, ocean and atmosphere. Two of these environments are fluid and highly mobile, while the third, the land, is comparatively stable and enduring. The interactions between these involve many natural forces such as wind, river discharge, waves, salt spray and ocean currents. Coastal processes take place at a wide range of spatial and temporal scale. Algal blooms, harmful or not, can extend from several hundreds of metres up to several hundreds of kilometres across (Smayda, 1997). Weather events such as storms and flooding might affect a region, or a bay, or just the area around a particular river mouth. Cliff erosion as well as beach erosion usually occurs more locally, sometimes affecting stretches of coast only a few metres wide. Coastal vegetation succession or degradation is measurable at a sub-metre scale. In addition to this wide range of spatial scale, coastal processes also work at a variety of temporal scales. Most dramatic are the events of erosion and land loss through single storm events, while other, slower processes such as sea level rise and related changes in nearshore sediment dynamics are progressive, and their results only become visible over decades. Thus, the only thing that is constant at the coast is that it is in a permanent state of change. Remote sensing, whether from orbiting (space-borne) or air-borne platforms, can greatly assist in the task of monitoring coastal environments. In particular, remote sensing enables simultaneous or near-simultaneous capture of data for an extensive area of ground, which can be important for coastal management purposes given the length of many countries' coastlines (Table 4.1); while remote sensing also allows good repeat coverage and hence the acquisition of long time-series of observations, and the significance of coastal changes to be more easily evaluated. It is striking that despite the long history of multispectral and other remote sensing techniques for land cover assessment in non-coastal, strictly terrestrial environments, a comparative scarcity of published literature suggests that very little operational remote sensing has been applied to similar requirements at the coast. Anecdotal evidence suggests that, up to and including the early years of the twenty-first century, many practitioners were sceptical of the value that remote sensing could bring to coastal management, although the author's experience suggests that this might be more due to negative experiences based on trying to apply the wrong data to the wrong purpose. The following sections will explore the variety of established and upcoming types of remote sensing data, their spatial, temporal and spectral resolution and will give some examples of practical applications in the coastal space. The relation between remote sensing and GIS for effective marine and coastal spatial planning will also be considered, and the chapter will close with recommendations on how to decide on which data to use for which purpose and which environmental factors are to be considered for appropriate image interpretation.