1 – INTRODUCTION

1.1– General introduction

The Rhone Delta is a relatively recent and extremely fragile geological feature intruding southwards into the north of the Gulf of Lyon. A reversal of its growing trend has been observed during the last century, mostly due to anthropological reasons (Sabatier, 2001). This poses a threat to the natural communities inhabiting the area and the human settlements alike.

A global trend towards a warmer climate is increasing the sea-level (Suanez et al., 1996), while the construction of dams (both retaining sediment and laminating avenues, thus decreasing their peaks and sediment transport capabilities) and the increase in forest cover of the catchment basin have caused a diminution of the sediment input in the delta that it previously received from the river. These facts have made the previously existing equilibrium in the system no longer valid, since the two main agents eroding and reshaping the delta, eolian and maritime actions, have not changed and continue to move the sediment already there.

In the context of the Rhone Delta, a third agent has to be taken into account: human actions. These need not be understood as general anthropological actions like the ones causing the dwindling sediment input, but as pure “coastal engineering/delta management” works, such as the opening of drainage canals from the deltaic lakes to the sea (Grau de Roustan) or the construction of dikes, breakwaters and harbours, specifically focused on driving the evolution of the delta in a particular direction, in general, preventing the retreat of the coast. These installations do not dot the whole shore involved, but, where present, their effect is profound and can be felt well beyond their immediate setting.

Civil engineering works notwithstanding, the waves’ actions are the most important actor in the current evolution of the delta, being it a sandy area in a micro-tidal setting. Therefore, studying the waves’ conditions along its coast and evaluating their effects on the shore is of utter importance in order to predict the future evolution of the delta, key to adopt a correct management policy (if applicable), with the actuations needed. Ignoring the wind and human actions is certainly a simplification, but this is done in the spirit of efficiency, aiming at the main cause explaining a behaviour, so that valuable information can be extracted with minimal effort.

1.2- Aim

The aim of this paper is to study the long-shore sediment transport at and around the Beaufort spit, in an area encompassing nearly 60 km of coastline, based exclusively on wave records and shore and sea-bottom data. In order to do so, two important partial goals are set:
• Estimate the wave climate both offshore and nearshore the study zone
• Estimate the effects of these waves on the coast, coupling their actions with its given characteristics (geometry, material)

1.3- Problem approach

In order to reach the goals stated above, several intermediate steps need to be taken, as shown below:

The reason for breaking the wave climate part into 3 different steps is that a direct propagation of the wave climate cannot be done from the buoy to the nearshore breaker zone points where the sediment transport formulae may be applied. First a backward propagation towards deep water conditions must be made, and from there, a forward propagation will return the shore conditions. This is in turn separated into two steps, because SWAN, the program used for the propagation, is deemed not precise enough nearby the breaker zone, and therefore a different method is used for its final stretch. On the first stretch of this forward propagation (which is performed by SWAN) results are also given at the buoy location, so that the calculated wave climate can be compared to the
original record. This allows for a feedback mechanism to fine-tune the offshore boundary conditions that need to be fed to the program.

**1.4- Layout**

After the present introduction, chapter 2 will offer a description of SWAN, the program used for the first part of the wave propagation. Chapter 3 physically describes the study area, enumerates its human settlements and presents the data available. Chapter 4 deals with the step by step work and the results this yielded. Chapter 5 summarises the work and outlines its main conclusions. Chapter 6 suggests possible improvements and future work lines. Finally, appendixes enclosed at the end of the report include all the data, formulation and results that, albeit relevant, were deemed too specific or tedious to be included in the main body of work, where they would have disrupted the continuity and easiness of read.