Wave Energy Resource Assessment and Device Selection

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Introduction

According to the IPCC, wave energy extraction could contribute to the reduction of carbon emissions and has low environmental impacts [1]. Based on the distribution of the resource, globally (fig. 1), relevant technologies could be employed and adjusted. Precise information is required for the calculation of the wave power with respect to the significant wave height and the wave period, according to the equation

$$P = \frac{\rho g^2}{64\pi} H_{m_0}^2 T_e \approx \left(0.490\, {}^{kW}/_{m^3 s}\right) H_{m_0}^2 T_e$$

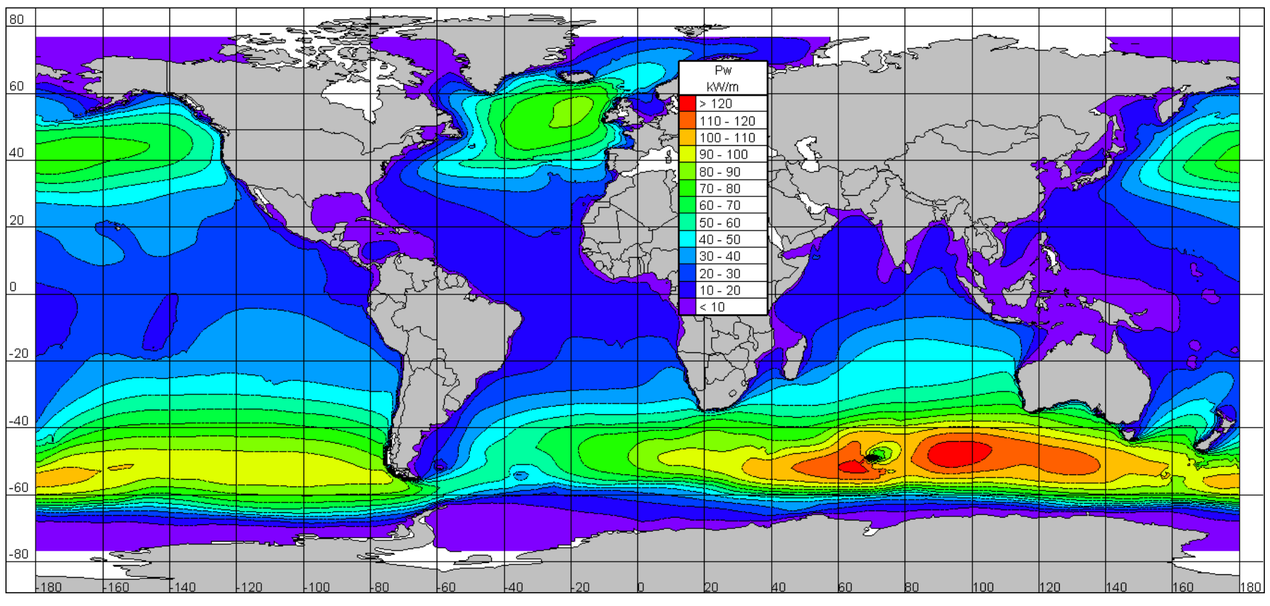
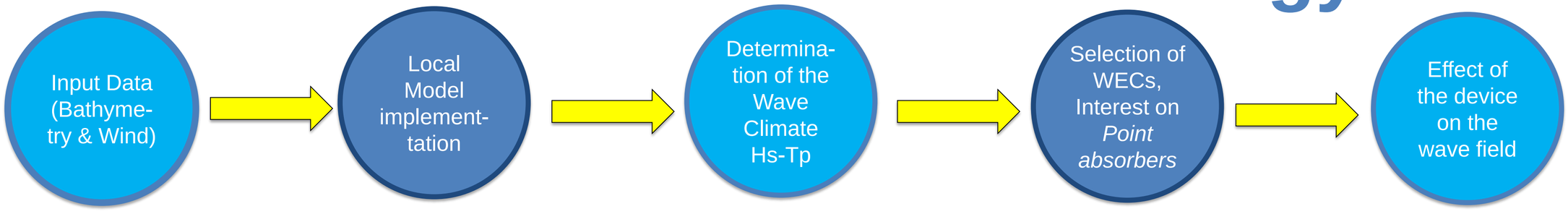


Figure 1: Spatial distribution of Wave Energy [2].

Aim and Objectives:

To select the optimum Wave energy converter type, according to the wave climate of a specific area and to assess the effect of an array on the local wave climate.

Methodology



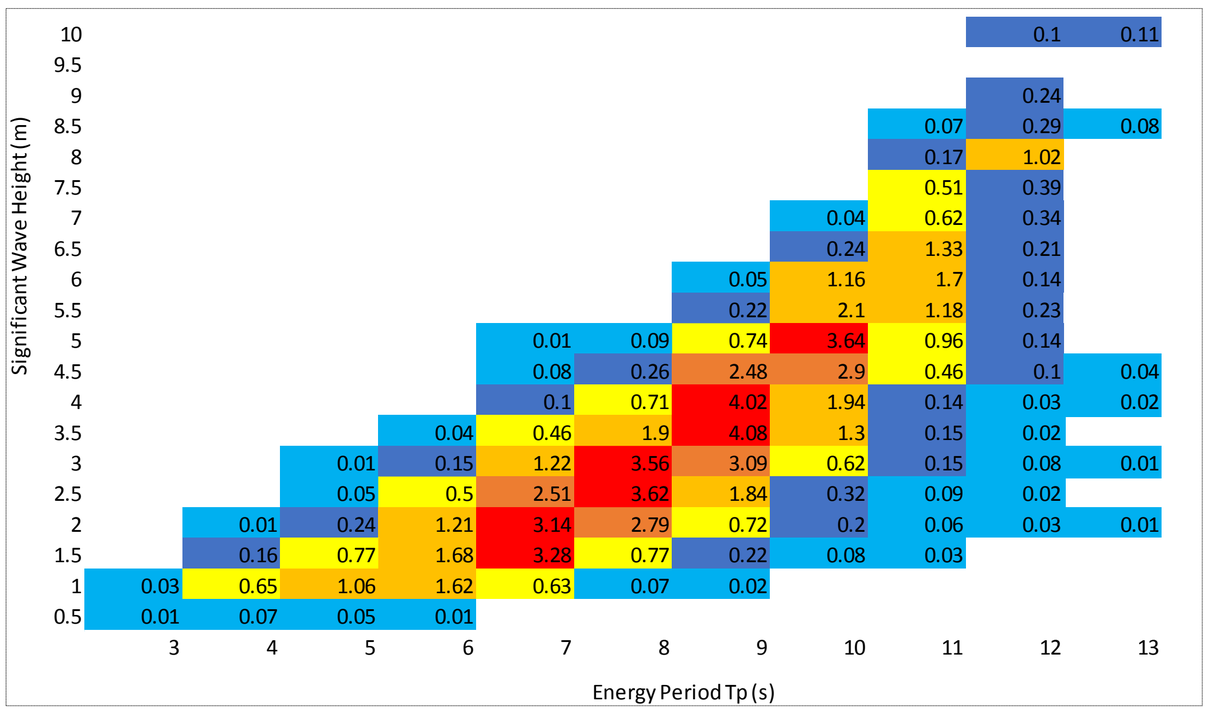


Figure 2: Joint Distribution for annual energy estimation for Menorca, [3].

Wave Climate

The assessment of the Wave power includes the use of Power Matrices presented in [4], for device selection, after the Hs-Tp distribution has been determined (fig.2). Those devices differ in operation, dimensions, deployment water depth and geometry (fig. 3).

Figure 3: Small bottom referenced heaving buoy (a), floating 2 body heaving converter (b) & bottom fixed heave buoy (c), [4].

Effect of WECs on the wavefield

Use of a *phase resolving model*, to assess the effect of the chosen device on the Significant Wave Height, thus on the resource itself. The state of the art methodology employs either wave tank experiments or phase averaged models.

References

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