INTERNSHIP
WEATHER EXTREM EVENTS FOR MARINE DESIGN

PRINCIPIA

INTRODUCTION:

PRINCIPIA, is a team of specialised engineers who develops its own software's to design of all type of marine structures in terms of hydrodynamic behaviour, structural loads and mooring analysis.

Whatever the sector, the key design parameters are numerical modelling and environmental conditions loading the marine structures.

For the time being, the environmental conditions for design purpose are derived by metocean companies in documents presenting the extreme events (storms, cyclones) on the basis of max wave height, max wind speed, etc. for various return period (100 years typically). These figures are built from Hindcast data (numerical model simulating 25 to 40years of local weather) by applying statistical models to obtain a 100 year return period wave height, current speed, etc.

The point is that, as designers, we know the maximum extreme event is not necessarily the dimensioning one (a lower wave with different period could be dimensioning) and we need a tool to build **fit for engineering extreme events**: that is one of the objectives of this internship.

Furthermore, in metocean report, extreme wind, wave and current are often presented without correlation. Rules and regulations societies propose some "conservative" way to combine them but this can lead to overload the model, over design the structure and ultimately increase project costs. The tool built during this internship shall enable the designing engineer to evaluate the joint probability and return period of several set of wind, wave and current extreme condition.

At a time, the floating wind energy sector is struggling to increase the number of commercial farms it needs cost effective solutions. This internship shall contribute to the green energy development by lowering conservatism and cost of designed structure.

SCOPE OF WORK:

<u>Objective:</u> The tool you'll build shall enable a design engineer to start with Hindcast data and end with a set of wind, wave and current extreme events with their joint probability and confidence interval.

The scope of work includes the 4 following tasks:

0. State of the art of metocean data processing for extreme event assessment (methodology and statistical models currently used in the industry) and understanding of marine structure design process.
1. Build a numerical toolbox (Scilab, Python, C++, Fortran …) which can derive wave, wind and current individual directional extreme condition (and confidence interval) on the basis of Hindcast data. This implies the gathering/built of a statistical processing library (extreme and regression).
2. Enhance the numerical toolbox with joint probability to answer question such as: What are the most probable current and wind intensity and direction associated to a 100 year return period storm wave coming from North?
3. Develop visualisation means of outputs.

DELIVERABLES:

Technical report including

- ✓ State of the art
- ✓ Numerical tool
- ✓ Comparison of built tool with existing metocean report for validation purpose

GENERAL:

- ✓ Duration: 6 months
- ✓ Start date: Early 2020
- ✓ Location: PRINCIPIA offices in La Ciotat (Bouches du Rhône).
- ✓ To apply : job@principia.fr