SIPROL

Tecnología·Innovación·Desarrollo

DEEP-WATER SPECTRAL WAVE DATABASE

$$\phi_t + \frac{1}{2}|\nabla\phi|^2 + g\eta = 0$$

***SIPROL®*: Four-Dimensional (4D) Virtual Geophysical Technology**

SIPROL® is a Chilean Four-Dimensional (4D) Virtual Geophysical Technology, based on the conservative treatment of energy, mass, and momentum transfer processes, devoted to describing complex geophysical phenomena in the atmosphere, the ocean, and soil / subsoil / earth's crust in the continent.

Using information on a planetary scale, mathematical modeling, high-performance computing, artificial intelligence, engineering science, earth science, and high-level management, ***SIPROL®*** generates and puts in the market frontier technological products. Namely 4D VIRTUAL GEOPHYSICAL DEVICES, such as: rain gauges, anemometers, thermometers, barometers, weather stations, thermocouples, tide gauges, current gauges, pressure sensors, displacement sensors, etc. They describe complex dynamics in an extremely precise and timely manner, especially on a local scale anywhere in the world, to provide standard geophysical information, as well as defining specific key management indicators for each business area and customized for each client. This information is designed to be generated in remote data centers and to be hosted in the virtual cloud.

SIPROL® service offering consists, among others, in establishing historical records, generating forecasts, projecting weather trends, monitoring and raising early warnings/alerting of extreme events due to natural hazards, developing studies with high added value, to understand, explain or describe complex geophysical phenomena -past, present, or future-, in the fields of thermodynamics, meteorology, hydrology, limnology, operational oceanographic hydrodynamics, environment, hydrogeology, structural geology, geomechanics, geotechnics, prospecting and related areas.

SIPROL®-Wave-Hindcasting-v01

The deep-water spectral wave database ***SIPROL®-Wave-Hindcasting-v01***, is the result of mathematical and computational modeling of wave generation and propagation in the Pacific Ocean Basin. This is carried out based on a third-generation spectral wave model, exhaustively calibrated to represent multimodal wave conditions on the American Continent's West Coast. The simulations were forced using 10-meter wind data and sea ice concentrations from the reanalyzed data sets CFSR and CFSv2 (Saha et al., 2010) (Saha et al., 2014).

Available Information

This database, which covers from 1980 to 2020, includes two-dimensional spectral information and a complete set of wave parameters (see Table 1) at 188 points located in deep waters off the American Continent's West Coast, including Continental and Insular Chile, in addition to a complete set of wave parameters in 2DH format in the entire Pacific Ocean Basin (see Table 2).

Table 1. Spectral parameters used to characterize a sea state (UNICAN, 2000).

Spectral parameters	Expression
*n*th order moment $[m_n]$	$m_n = \int_0^{\infty} \int_0^{2\pi} f^n S(f,\theta) df d\theta$
Wave heigh of zero order moment $[H_{m0}]$	$H_{m0} = 4\sqrt{m_0}$
Mean period $[T_{m01}]$	$T_{m01} = m_0/m_1$
Mean period equivalent to zero-crossing mean period $[T_{m02} \approx T_z]$	$T_{m02} = \sqrt{m_0/m_2}$
Energetic period $[T_{m-10}]$	$T_{m-10} = m_{-1}/m_0$
Peak frequency $[f_p]$	Frequency corresponding to the energy peak in frequency spectrum.
Peak period $[T_p]$	$T_p = 1/f_p$
Mean direction $[D_m]$	$D_m = \text{atan} \frac{\int_0^{\infty} \int_0^{2\pi} \sin(\theta) S(f,\theta) df d\theta}{\int_0^{\infty} \int_0^{2\pi} \cos(\theta) S(f,\theta) df d\theta}$
Peak direction $[D_p]$	Mean direction of the frequency segment of the bidirectional spectrum containing the peak frequency.

Table 2. 2DH output parameters available for postprocessing.

2DH outputs			
ID	**Variable**	**ID**	**Variable**
DPT	Depth	DP	Peak direction
WND	Wind	HIG	Infragravity wave height
HS	Significant height	CGE	Energy flux
T02	Mean period	PHS	Partitioned height
T0M1	Mean period	PTP	Partitioned peak period
T01	Mean period	PDIR	Partitioned direction
FP	Peak frequency	PSPR	Partitioned spread
DIR	Mean direction	PNR	Number of partitions
SPR	Mean directional spread		

Some Validations

The database was validated with instrumental information recorded by a buoy located 1500 kilometers to the West-Southwest of Arica, Chile, and a buoy belonging to the Hydrographic and Oceanographic Service of the Chilean Navy, located 20 kilometers off the Bay of Valparaíso, Chile.

To illustrate the database performance in deep waters, graphs of dispersion for the spectral significant height are shown below, between the mentioned instrumental records and ***SIPROL®-Wave-Hindcasting*-v01**.

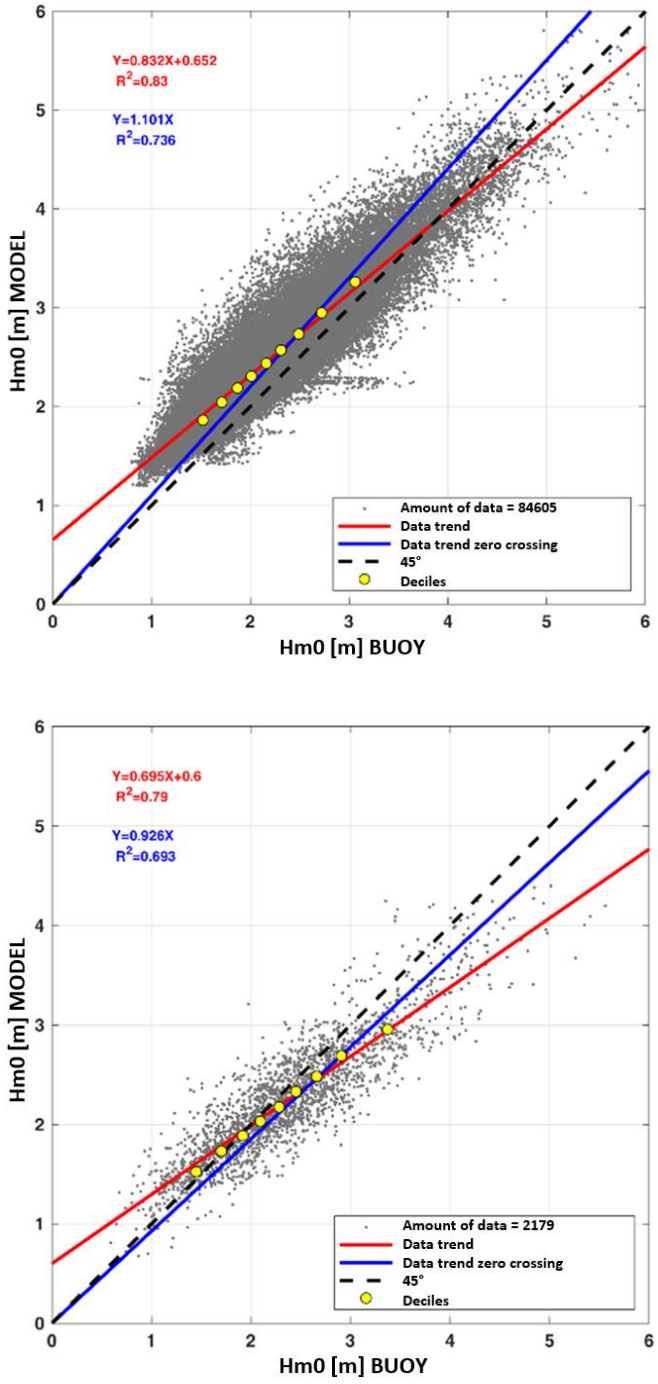

Figure 1. Dispersion graph of H_{m0} between instrumental records and ***SIPROL®-Wave***.
Up, instrument located in deep water off Arica, Chile.
Down, instrument located off the Bay of Valparaíso, Chile.

Information Acquisition and License Agreement

Values indicated are net, taxes are not considered.	**Wave Parameters**	**Bidimensional Spectra**
Any year	USD 600	USD 1200
Additional year	USD 100	USD 200

Number of Years	**Wave Parameters**	**Bidimensional Spectra**
1	USD 600	USD 1200
5	USD 1000	USD 2000
10	USD 1500	USD 3000
20	USD 2500	USD 5000
30	USD 3500	USD 7000
40	USD 4500	USD 9000

The purchase of a data set of ***SIPROL®-Wave-Hindcasting*-v01** constitutes a license agreement between the client and the company SIPROL SpA, which allows the client to use that information set for any purpose related to the areas of science and engineering for a single and determined project.

The purchase of a data set of ***SIPROL®-Wave-Hindcasting*-v01** allows the client to request an information update for a period of up to 2 years, assuming the corresponding cost per additional year. This update is only applicable to the original project.

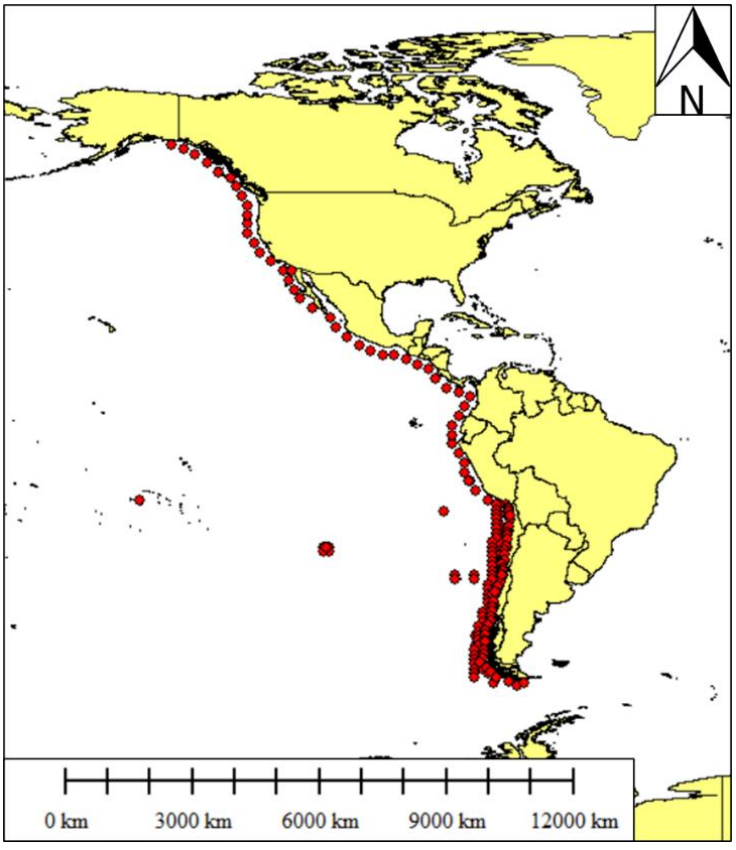

Figure 2. Location of the 188 virtual nodes with information on deep-water spectral waves in the American Continent's West Coast.

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