WIND.

## 10m u-component of wind (m s-1)

This parameter is the eastward component of the 10m wind. It is the horizontal **speed of air moving towards the east**, at a height of ten metres above the surface of the Earth, in metres per second. Care should be taken when comparing this parameter with observations, because wind observations vary on small space and time scales and are affected by the local terrain, vegetation and buildings that are represented only on average in the ECMWF Integrated Forecasting System (IFS).

## 10m v-component of wind (m s-1)

This parameter is the northward component of the 10m wind. It is the horizontal **speed of air moving towards the north**, at a height of ten metres above the surface of the Earth, in metres per second. Care should be taken when comparing this parameter with observations, because wind observations vary on small space and time scales and are affected by the local terrain, vegetation and buildings that are represented only on average in the ECMWF Integrated Forecasting System (IFS).

WAVES

## Significant height of combined wind waves and swell (m.)

This parameter represents the **average height of the highest third of surface ocean/sea waves generated by wind and swell**. It represents the vertical distance between the wave crest and the wave trough. The ocean/sea surface wave field consists of a combination of waves with different heights, lengths and directions (known as the two-dimensional wave spectrum). The wave spectrum can be decomposed into wind-sea waves, which are directly affected by local winds, and swell, the waves that were generated by the wind at a different location and time. **This parameter takes account of both**. More strictly, this parameter is four times the square root of the integral over all directions and all frequencies of the two-dimensional wave spectrum. This parameter can be used to assess sea state and swell. For example, engineers use significant wave height to calculate the load on structures in the open ocean, such as oil platforms, or in coastal applications.

## Maximum individual wave height

This parameter is an estimate of the height of the expected highest individual wave within a 20 minute time window. It can be used as a guide to the likelihood of extreme or freak waves.  
  
The interactions between waves are non-linear and occasionally concentrate wave energy giving a wave height considerably larger than the significant wave height. If the maximum individual wave height is more than twice the significant wave height, then the wave is considered as a freak wave. The significant wave height represents the average height of the highest third of surface ocean/sea waves, generated by local winds and associated with swell.

## Mean wave direction (degrees relative North <coming from>)

This parameter is the **mean direction of ocean/sea surface waves**. The ocean/sea surface wave field consists of a combination of waves with different heights, lengths and directions (known as the two-dimensional wave spectrum). **This parameter is a mean over all frequencies and directions of the two-dimensional wave spectrum**. The wave spectrum can be decomposed into wind-sea waves, which are directly affected by local winds, and swell, the waves that were generated by the wind at a different location and time. This parameter takes account of both. This parameter can be used to assess sea state and swell. For example, engineers use this type of wave information when designing structures in the open ocean, such as oil platforms, or in coastal applications. The **units** are **degrees true, which means the direction relative to the geographic location of the north pole. It is the direction that waves are coming from, so 0 degrees means "coming from the north" and 90 degrees means "coming from the east".**

## Mean wave period (s.)

This parameter is the **average** **time it takes for two consecutive wave crests, on the surface of the ocean/sea, to pass through a fixed point**. The ocean/sea surface wave field consists of a combination of waves with different heights, lengths and directions (known as the two-dimensional wave spectrum). This parameter is a mean over all frequencies and directions of the two-dimensional wave spectrum. The wave spectrum can be decomposed into wind-sea waves, which are directly affected by local winds, and swell, the waves that were generated by the wind at a different location and time. This parameter takes account of both. This parameter can be used to assess sea state and swell. For example, engineers use such wave information when designing structures in the open ocean, such as oil platforms, or in coastal applications.

## Peak wave period (s.)

This parameter represents the **period of the most energetic ocean waves generated by local winds and associated with swell.** **The wave period is the average time it takes for two consecutive wave crests, on the surface of the ocean/sea, to pass through a fixed point**. The ocean/sea surface wave field consists of a combination of waves with different heights, lengths and directions (known as the two-dimensional wave spectrum). **This parameter is calculated from the reciprocal of the frequency corresponding to the largest value (peak) of the frequency wave spectrum**. The frequency wave spectrum is obtained by integrating the two-dimensional wave spectrum over all directions. The wave spectrum can be decomposed into wind-sea waves, which are directly affected by local winds, and swell, the waves that were generated by the wind at a different location and time. This parameter takes account of both.

## Benjamin-Feir Index BFI (dimensionless)

This parameter is **used to calculate the likelihood of freak ocean waves, which are waves that are higher than twice the mean height of the highest third of waves**. Large values of this parameter **(in practice of the order 1)** indicate increased probability of the occurrence of freak waves. The ocean/sea surface wave field consists of a combination of waves with different heights, lengths and directions (known as the two-dimensional wave spectrum). This parameter is derived from the statistics of the two-dimensional wave spectrum. More precisely, it is the square of the ratio of the integral ocean wave steepness and the relative width of the frequency spectrum of the waves. Further information on the calculation of this parameter is given in Section 10.6 of the ECMWF Wave Model documentation.

## Wave spectral kurtosis (dimensionless)

This parameter is **a statistical measure used to forecast extreme or freak ocean/sea waves. It describes the nature of the sea surface elevation and how it is affected by waves** generated by local winds and associated with swell. Under typical conditions, the sea surface elevation, as described by its probability density function, has a near normal distribution in the statistical sense. However, under certain wave conditions **the probability density function of the sea surface elevation can deviate considerably from normality, signalling increased probability of freak waves**. This parameter gives one measure of the deviation from normality. It shows how much of the probability density function of the sea surface elevation exists in the tails of the distribution. So, a positive kurtosis (typical range 0.0 to 0.06) means more frequent occurrences of very extreme values (either above or below the mean), relative to a normal distribution.