

Setting wave-direction limits in Seasonde software

In order to improve the stability of the solution for wave parameters, it's important to include any pre-knowledge on wave directions to restrict the least-squares solution to acceptable values. In this document, we discuss how this is done in Seasonde software.

Wave directions are defined in degrees clockwise from North to the direction the waves are coming from; see Fig.1 for examples.

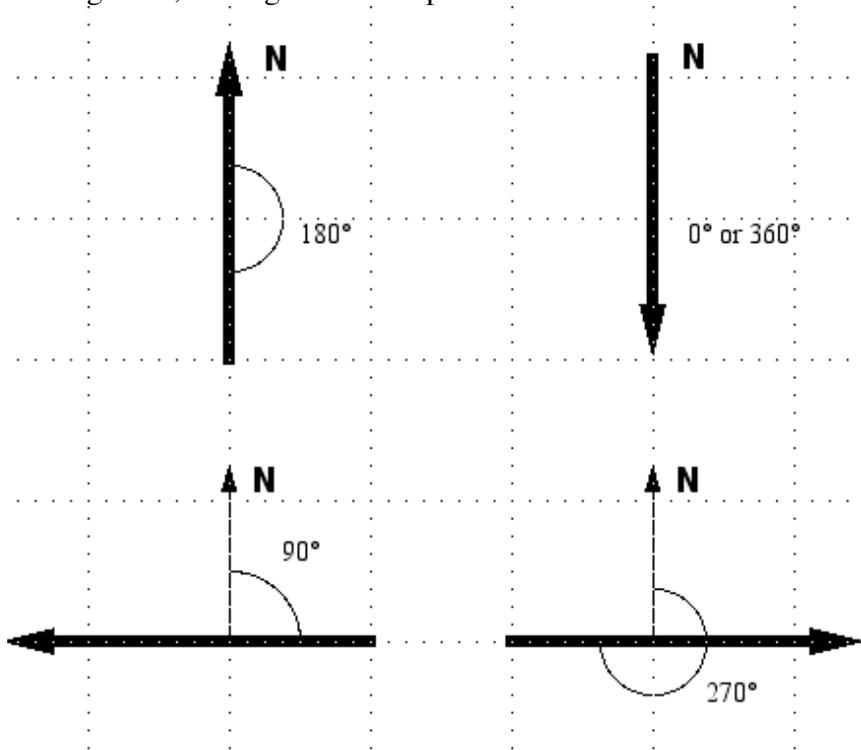


Fig.1 Examples of wave direction angles in degrees True. The bold arrow indicates wave vector.

Seasonde software limits solutions for wave direction in the following ways:

- (1) Short waves follow the local wind. In bays and harbors where fetch is limited, waves may be assumed to be short. Setting *Analysis Options Line 15* to 1 will constrain all waves to follow the wind.
- (2) On the open ocean, long waves dominate the wave field. Long waves don't always follow the local wind as swell may propagate from distant locations. For this case, *Analysis Options Line 15* needs to be set to zero. Long offshore waves don't develop close to the coast due to the limited fetch. We can therefore specify onshore wave directions. Wave direction limits θ_1 , θ_2 are set in *Header Line 26* as integer degrees clockwise from North. Wave directions will then be constrained to range from θ_2 clockwise to θ_1 .

Here are some examples of defining wave angle limits:

(a) For a West-coast location, wave directions can be limited from South clockwise to North, see Fig.2a. For this case, $\theta_1=360^\circ$ $\theta_2=180^\circ$.

(b) For an East-coast location, wave directions can be limited from North clockwise to South, see Fig.2b. For this case, $\theta_1=180^\circ$ $\theta_2=360^\circ$.

(c) For operation from a platform, it is usually appropriate to allow all wave direction, see Fig. 2c. In that case $\theta_1=1^\circ$ $\theta_2=360^\circ$.

(d) When the wave direction is restricted by land, the limiting angles should be set in the Header. For example: operating in a fjord, see Fig. 2(d), waves are essentially constrained to come from the North-west, For this case $\theta_1=315^\circ$ $\theta_2=315^\circ$.

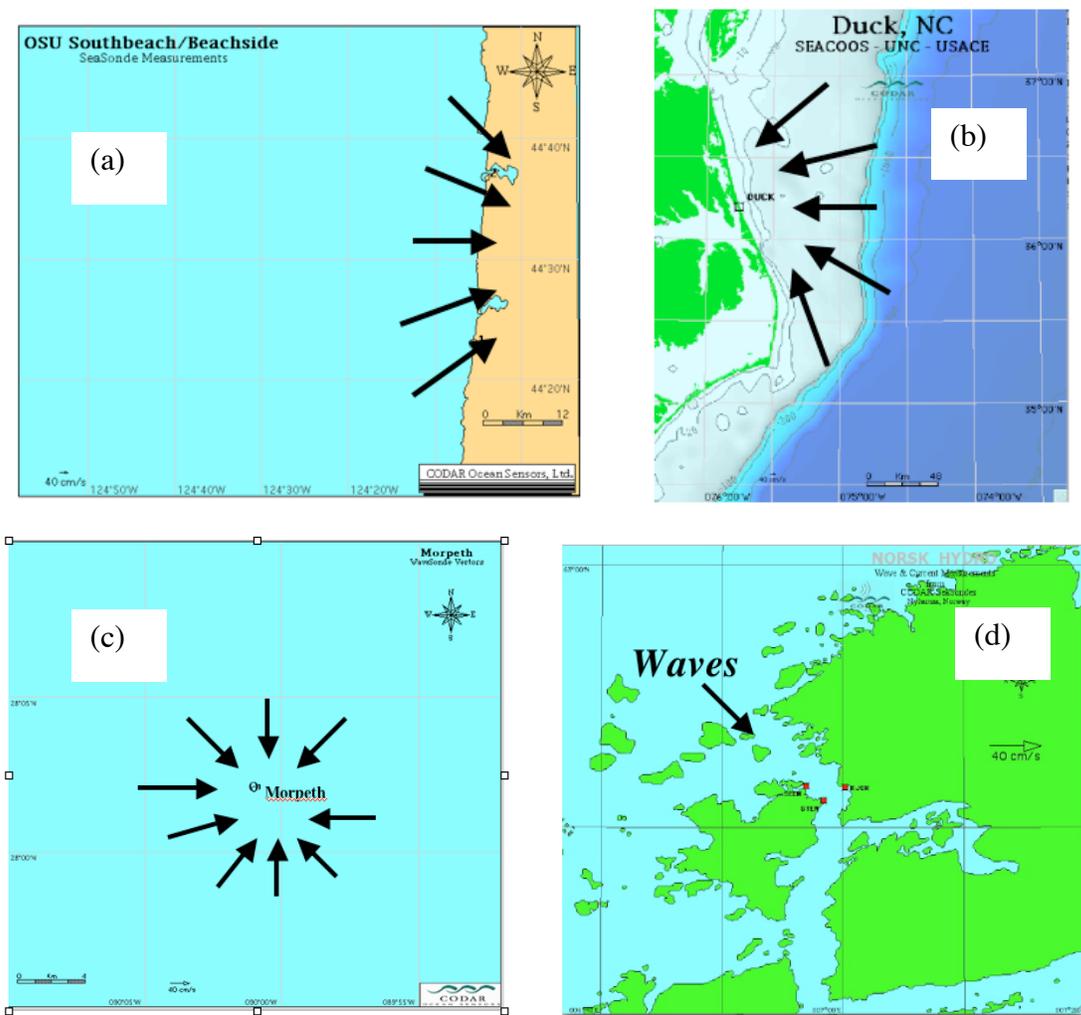


Fig. 2 Examples of wave angle limits (a) West coast situation (b) East coast situation (c) Operation from a platform (d) Operation in a fjord.

NOTE: Wave angle limits should not be confused with the radar cutoff angles set in Header Line 18. For operation from a straight coast, radar cutoff angles are referred to as coastline angles. Radar cutoff angles define the directions from which the radar receives sea-echo and may be defined by obstacles such as jetties or promontories that don't affect the ocean wave field. Wave angle limits define where long ocean waves can approach the radar.