

Ocean surface wave dynamics, energy and momentum air-sea transfer under a variety of wind and waves conditions.



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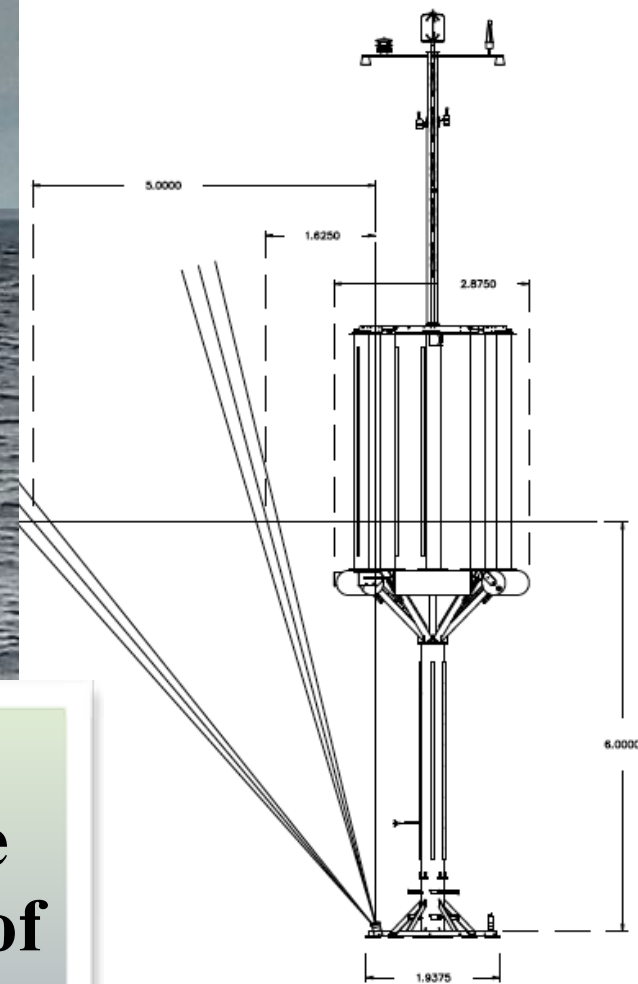
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Ocean surface wave dynamics, energy and momentum air-sea transfer under a variety of wind and waves conditions.



- Progress report.**
- Efforts to establish buoy network (CONACYT-SENER 201441) project.**
- Enhanced spar buoys to study ocean surface wave dynamics (own electronics design).**
- Focus in air-sea interaction and surface currents (upper ocean, lower atmosphere).**
- Directional wave spectrum and its evolution (recognised as key variable).**
- Under varying winds, atmospheric front.**
- Analysing SAR image to retrieve wave information.**
- Final remarks.**



Enhanced spar buoys: own electronics design, more sensors. Sonic anemometer, Met station, air & water CO₂, 6 capacitance wave staff, CTD(O₂, pH), ADCP, ADV, electronics unit with 6 dof motion sensor, solid state drives, rechargeable batteries, wind generator and solar panels [LiCor CO₂ sensor, 2 video cameras]. Simultaneous measurements are needed.



Graber, Terray, Donelan, Drennan, Leer, Peters (2000). ASIS a new air-sea interaction spar buoy: design and performance at sea, JAOT.



BOMM1 deployed on July 12, 2018

Test site, offshore Ensenada
BOMM1: Nov2017-Jan2018
BOMM2: Mar-Jun2018
BOMM3: Sep-Nov2018

Google Earth

Network for oceanographic observations (physical, geo-chemical, ecological) to generate scenarios upon exploration and production activities of offshore oil in the Gulf of Mexico, 201441 CONACyT-SENER project.

SENER
SECRETARIA DE ENERGIA



CONACYT

Interim Web Site Oceanographic Buoys :<http://cigom-boyas.cicese.mx/>

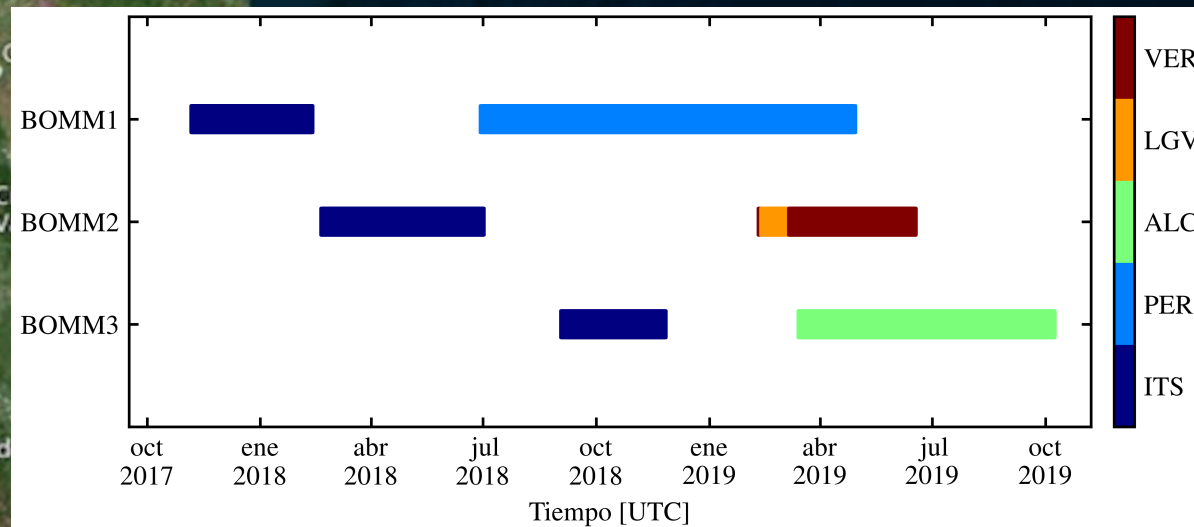
cigom-boyas.cicese.mx



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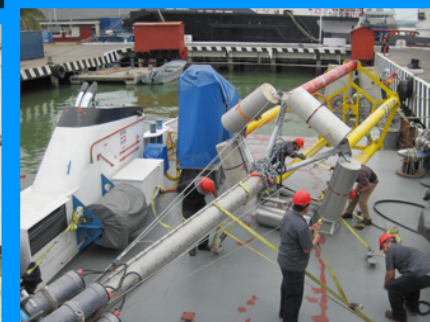
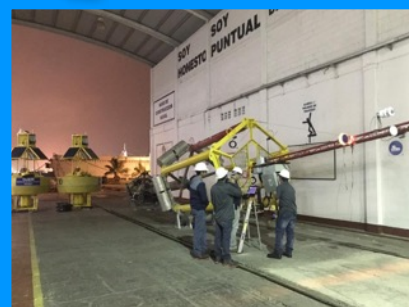
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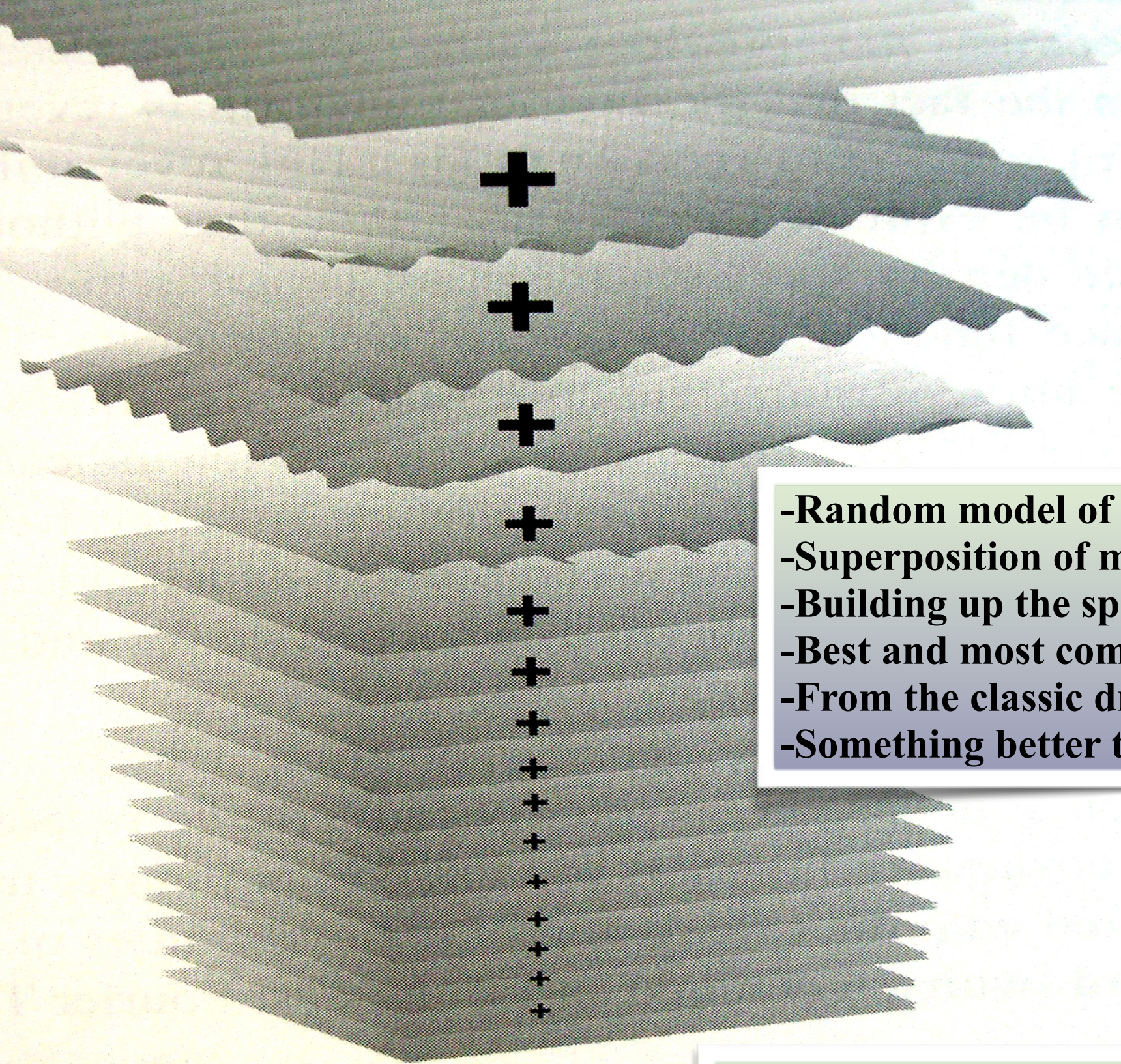
Tx each 1h, check 2019-03-27



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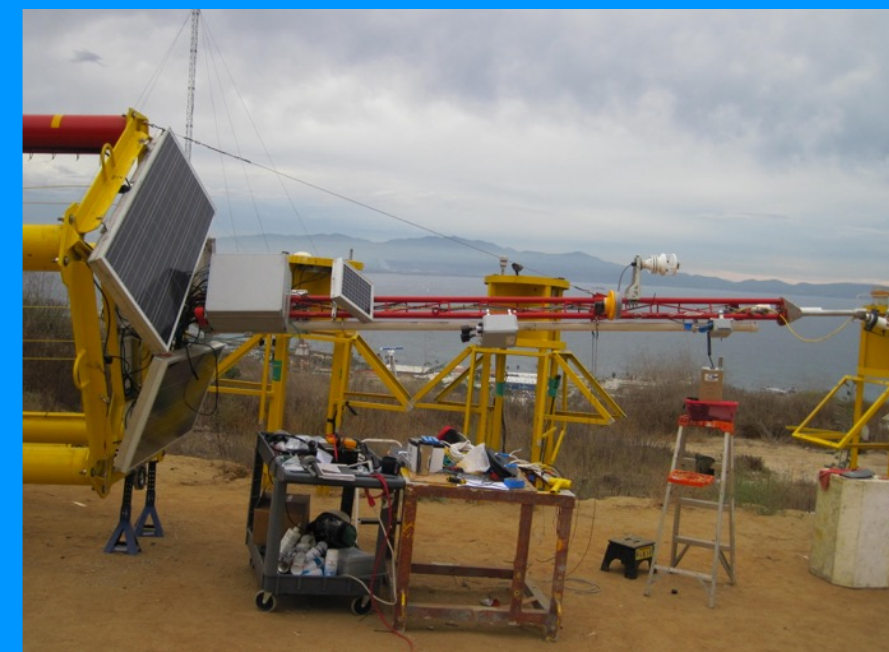
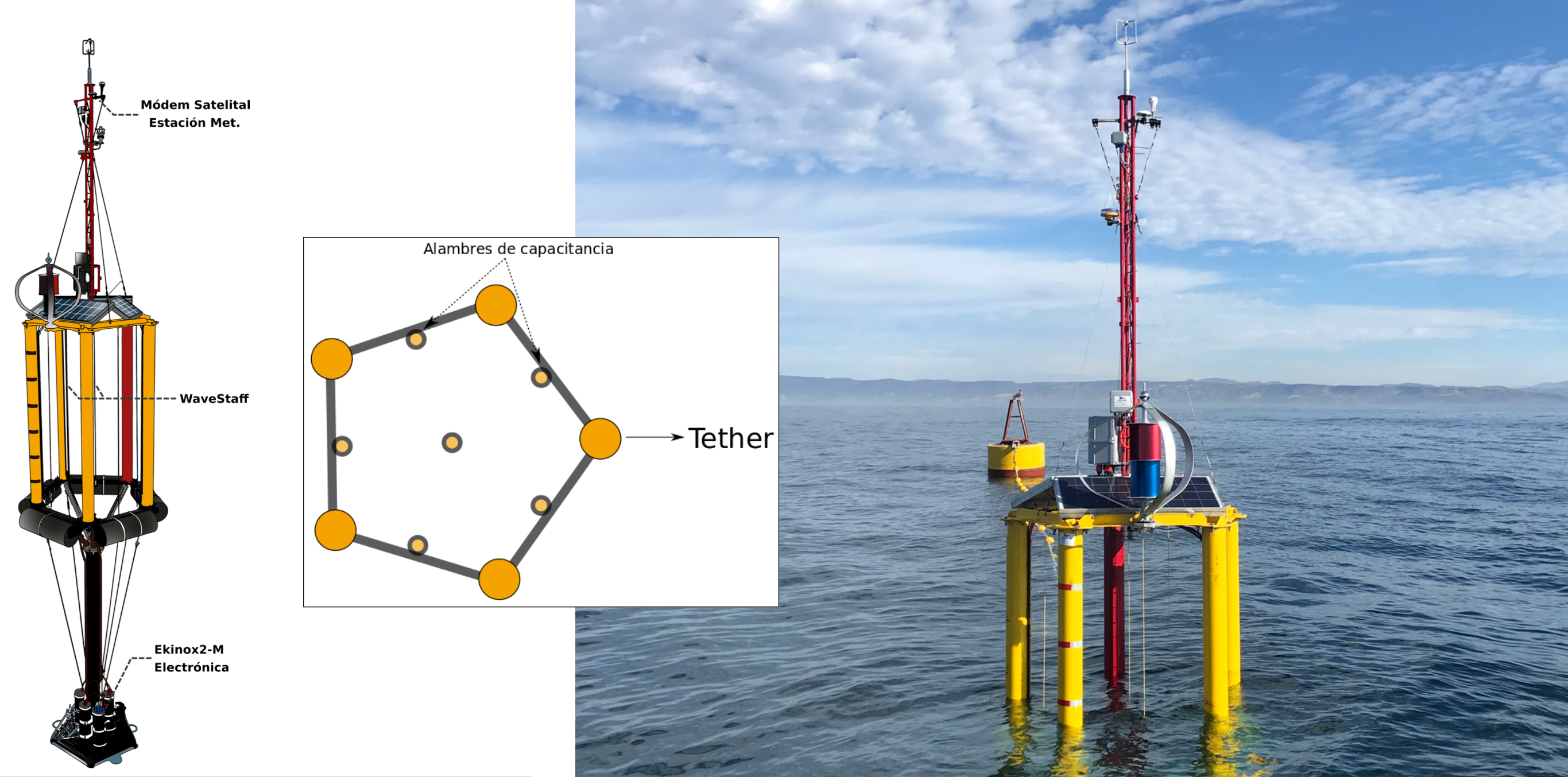
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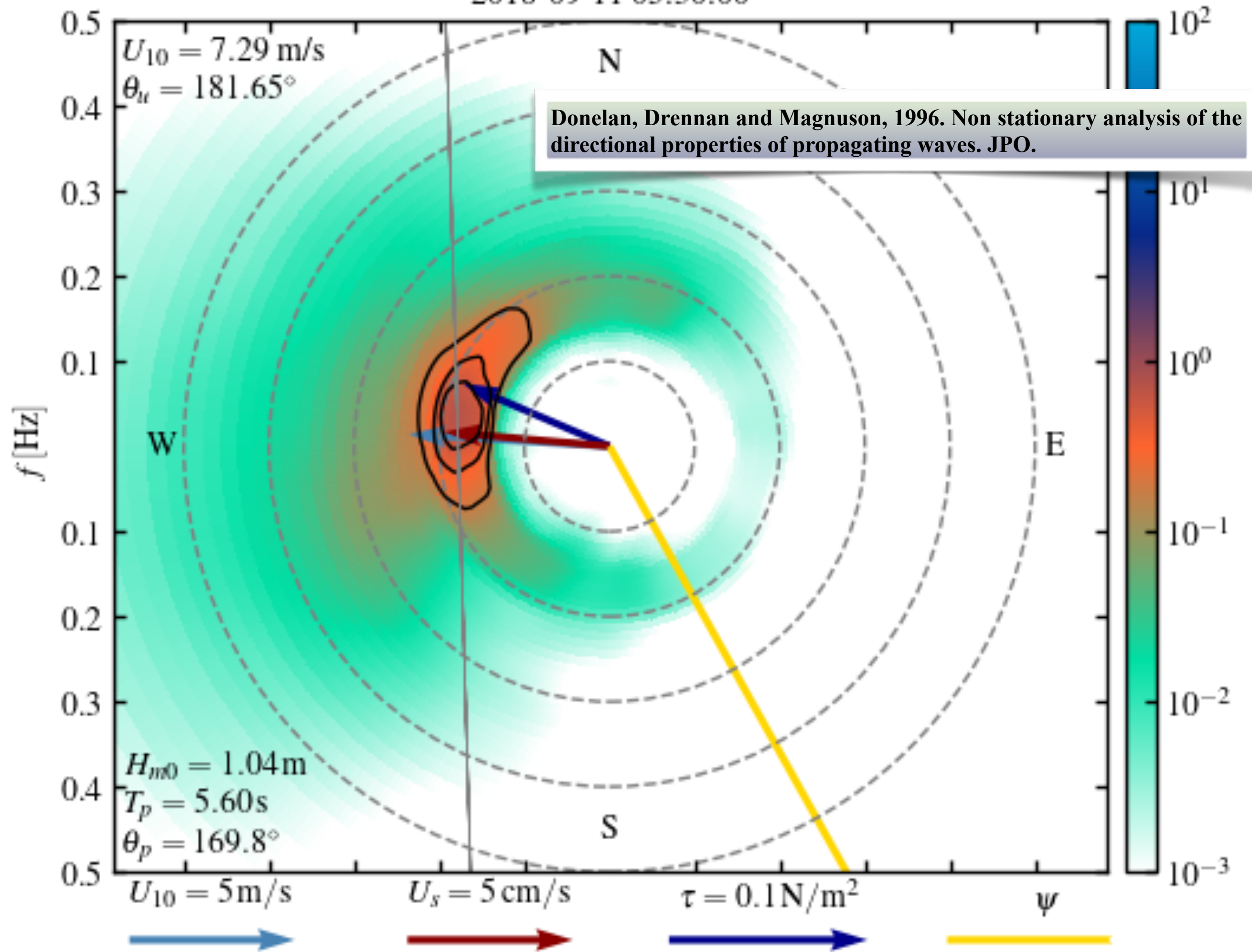


- Random model of the sea surface
- Superposition of many wave components
- Building up the spectrum notion
- Best and most complete description
- From the classic drawing of Pierson et al (1955)
- Something better than the 'First Five' is needed

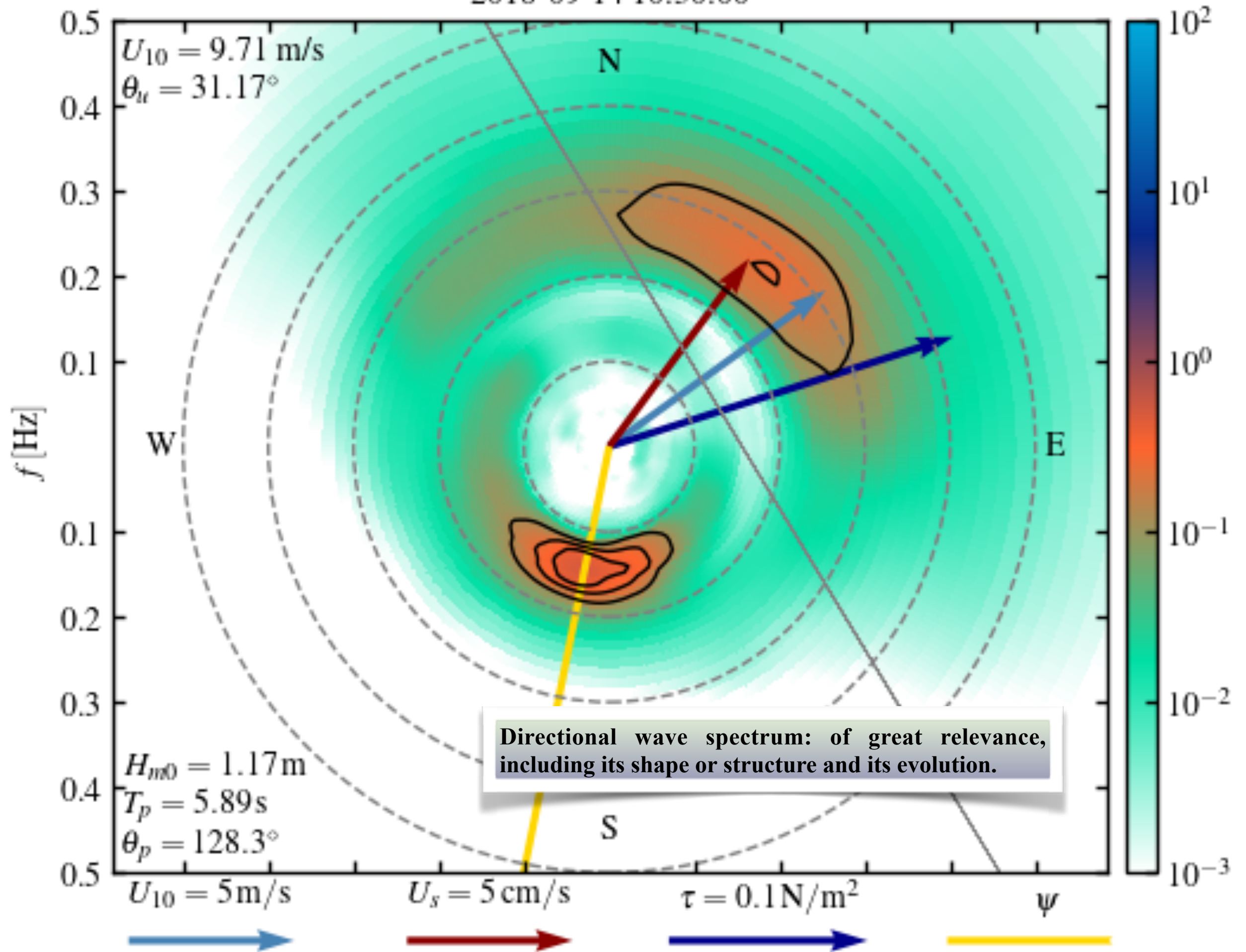
Pierson, W. J., G. Neumann, and R.W. James: *Practical methods for observing and forecasting ocean waves by means of wave spectra and statistics*, U.S. Navy Hydrographic Office Publ. No. 603, 1955.

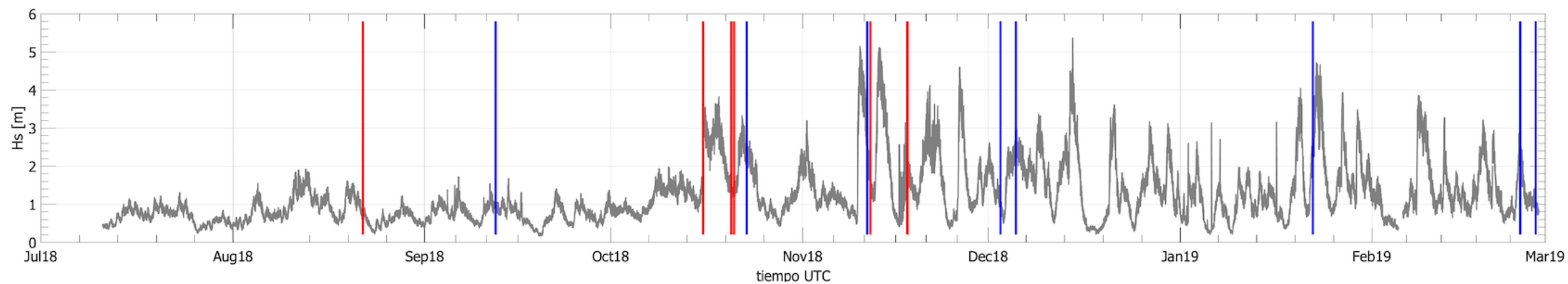
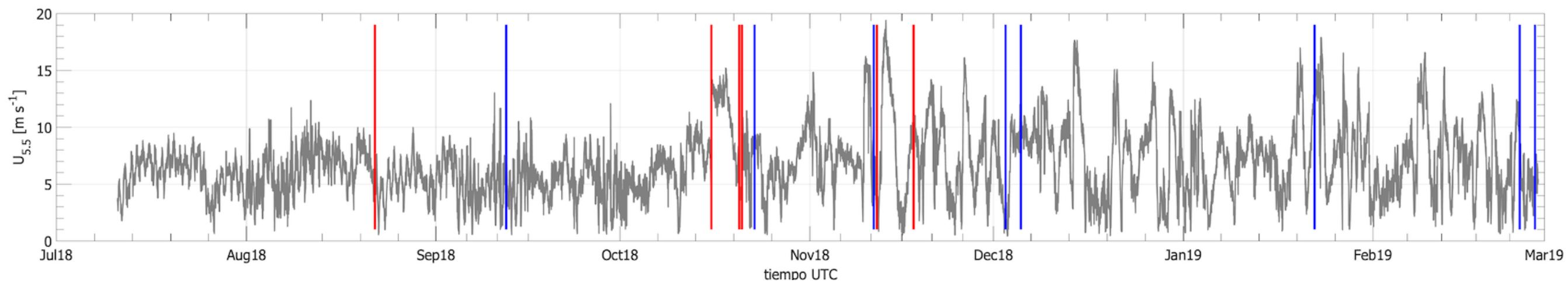


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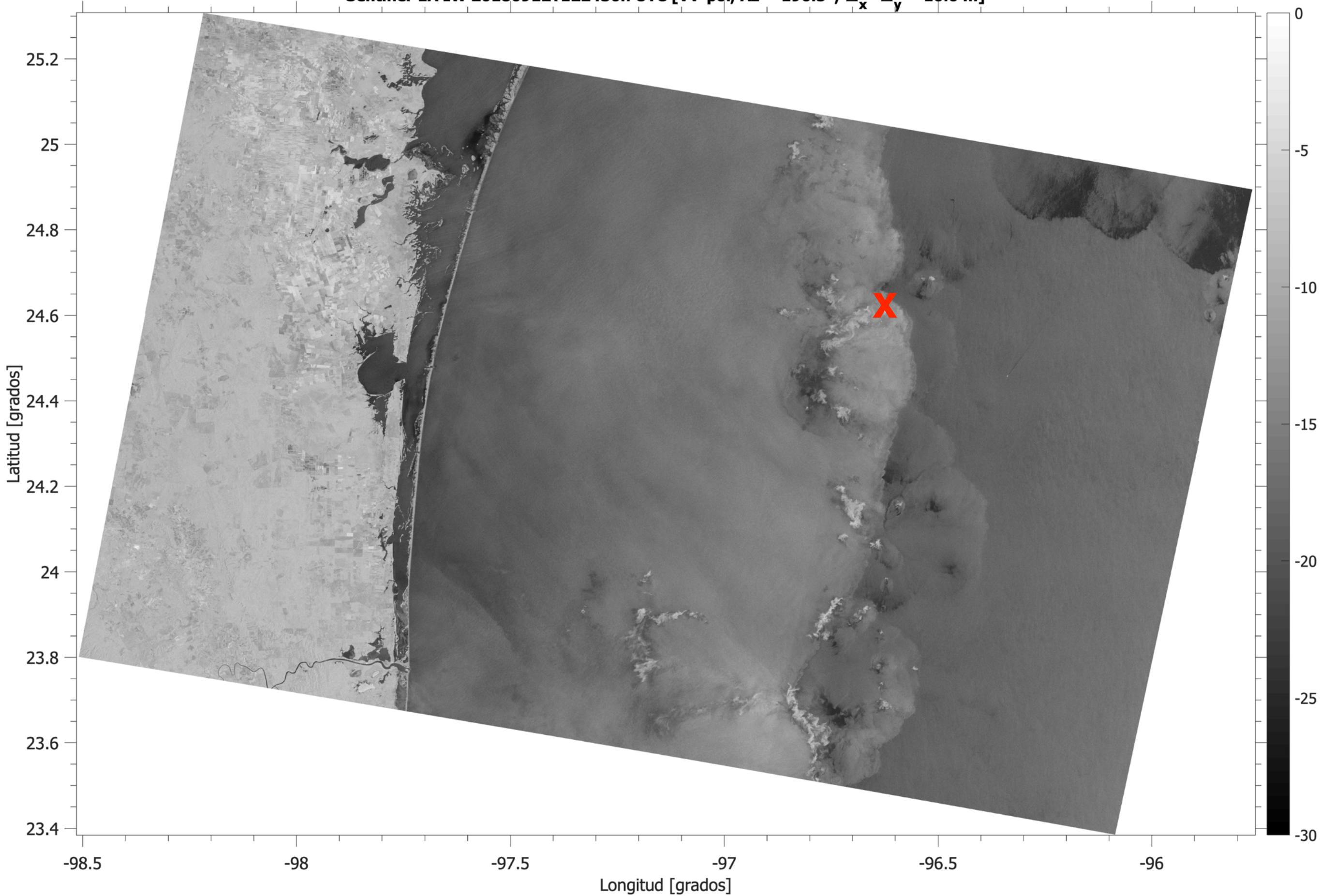
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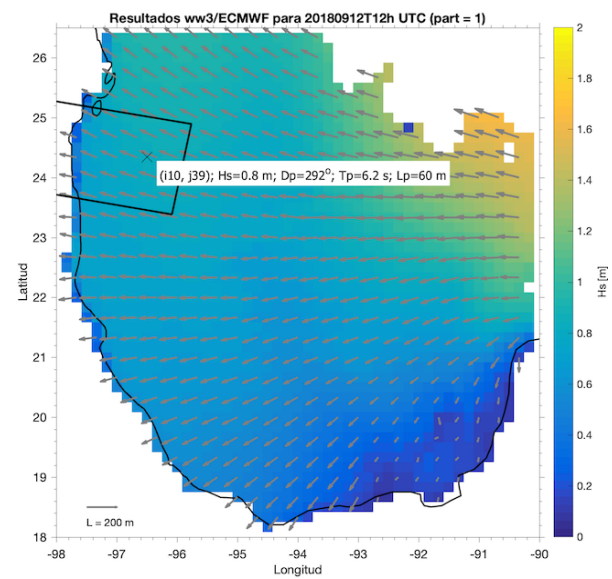
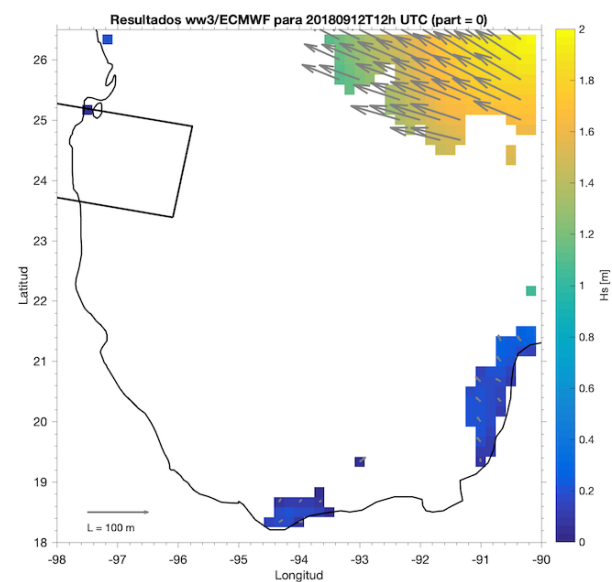
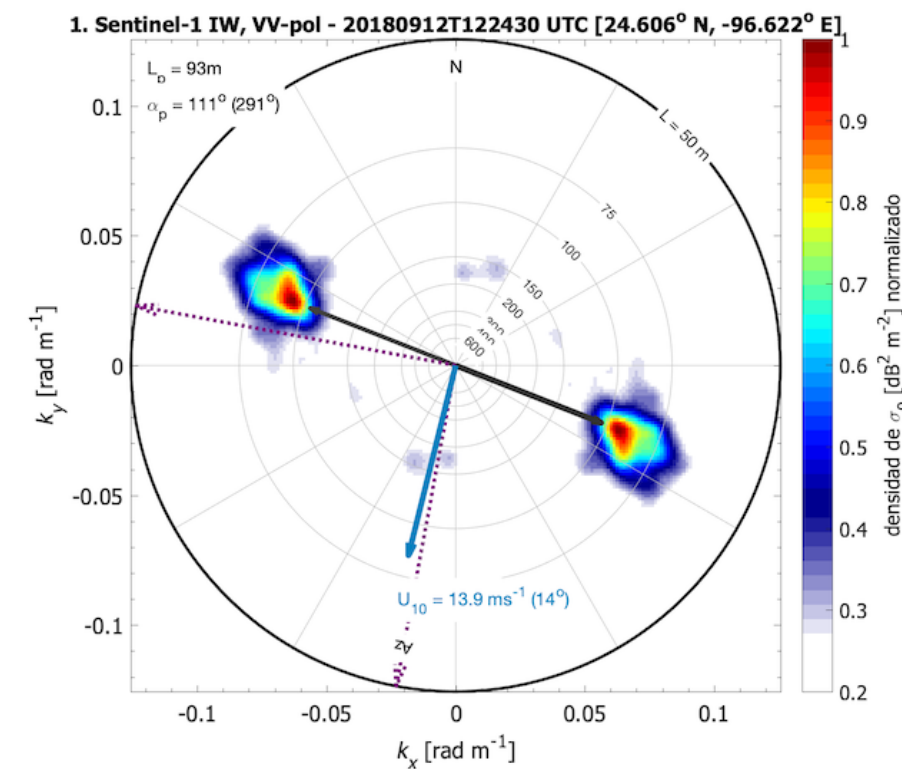
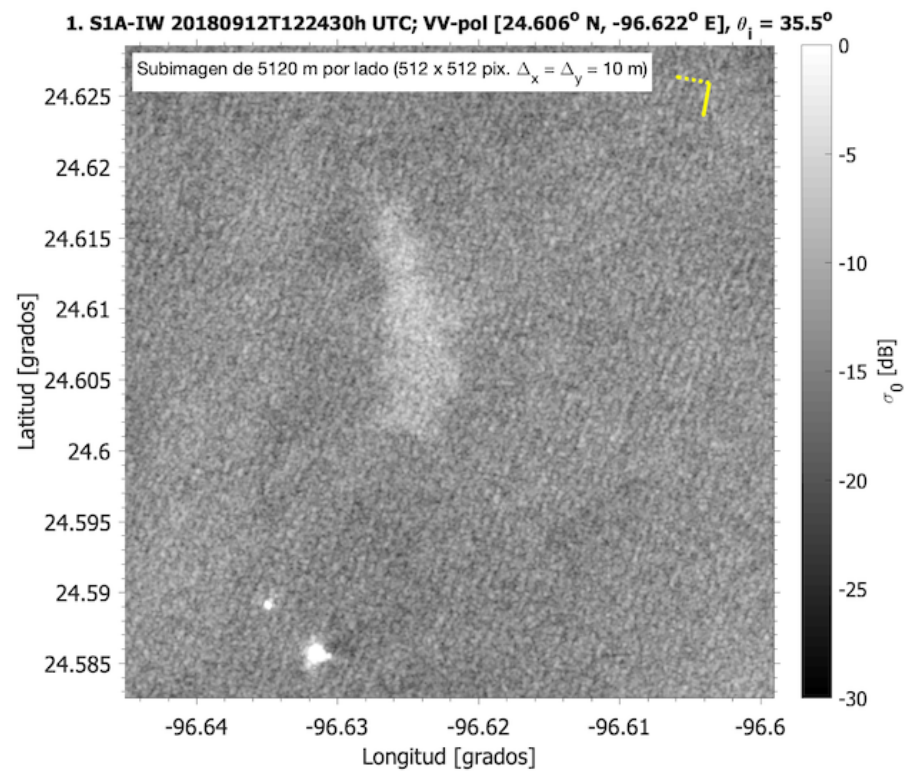
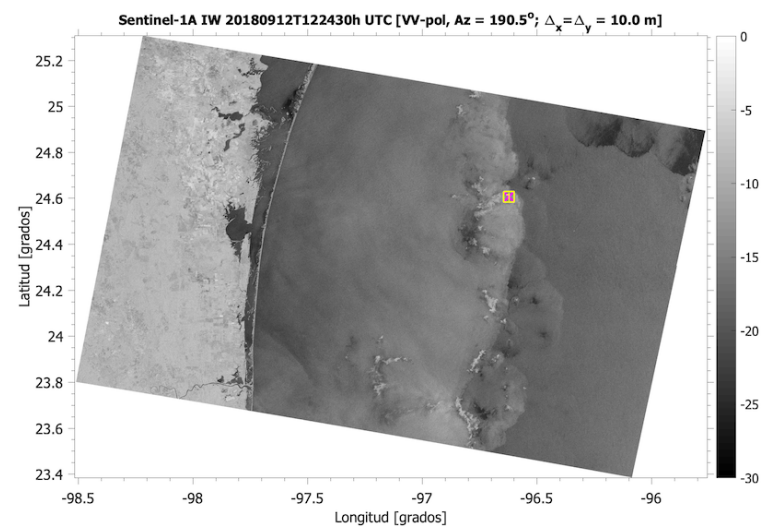




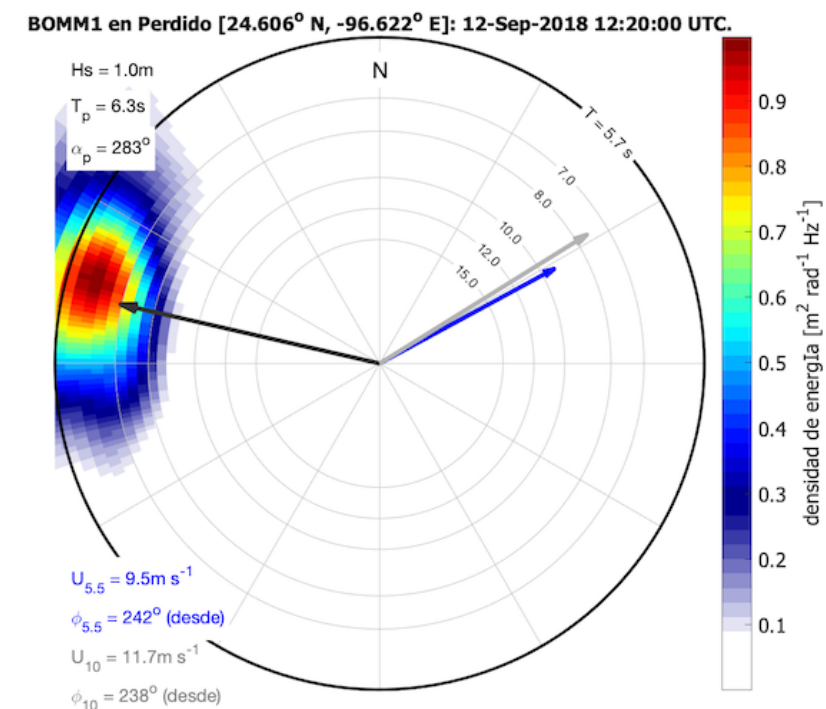
Wind speed and significant wave height as recorded by BOMM1 at Perdido region (Gulf of Mexico). Vertical lines indicate acquired SAR image (TerraSAR-X or TanDEM-X; Sentinel-1A or -1B).

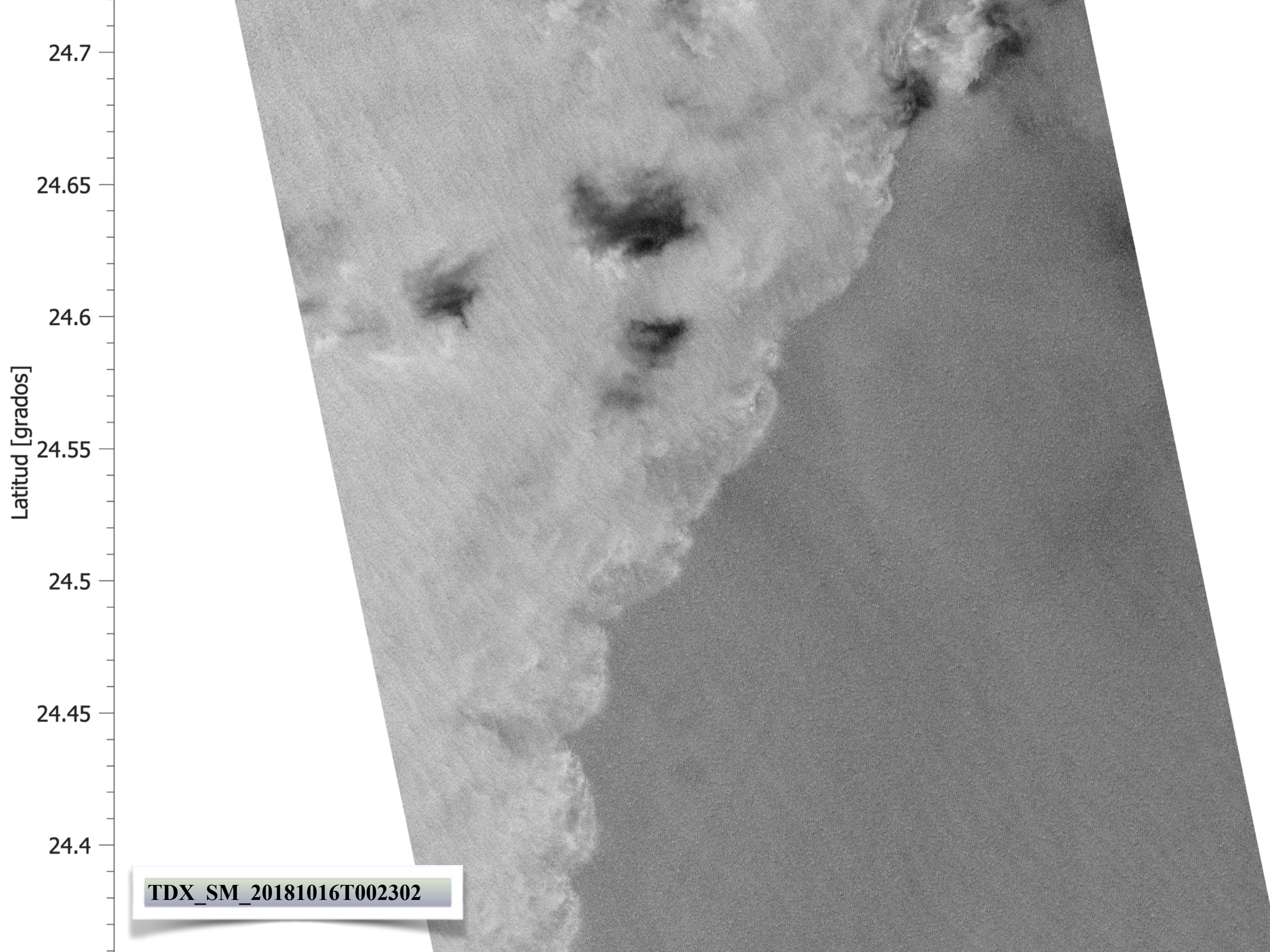
Sentinel-1A IW 20180912T122430h UTC [VV-pol, Az = 190.5°; $\Delta_x = \Delta_y = 10.0$ m]





SAR image spectrum inversion to estimate the directional wave spectrum, still under tests.





Latitud [grados]

24.7

24.65

24.6

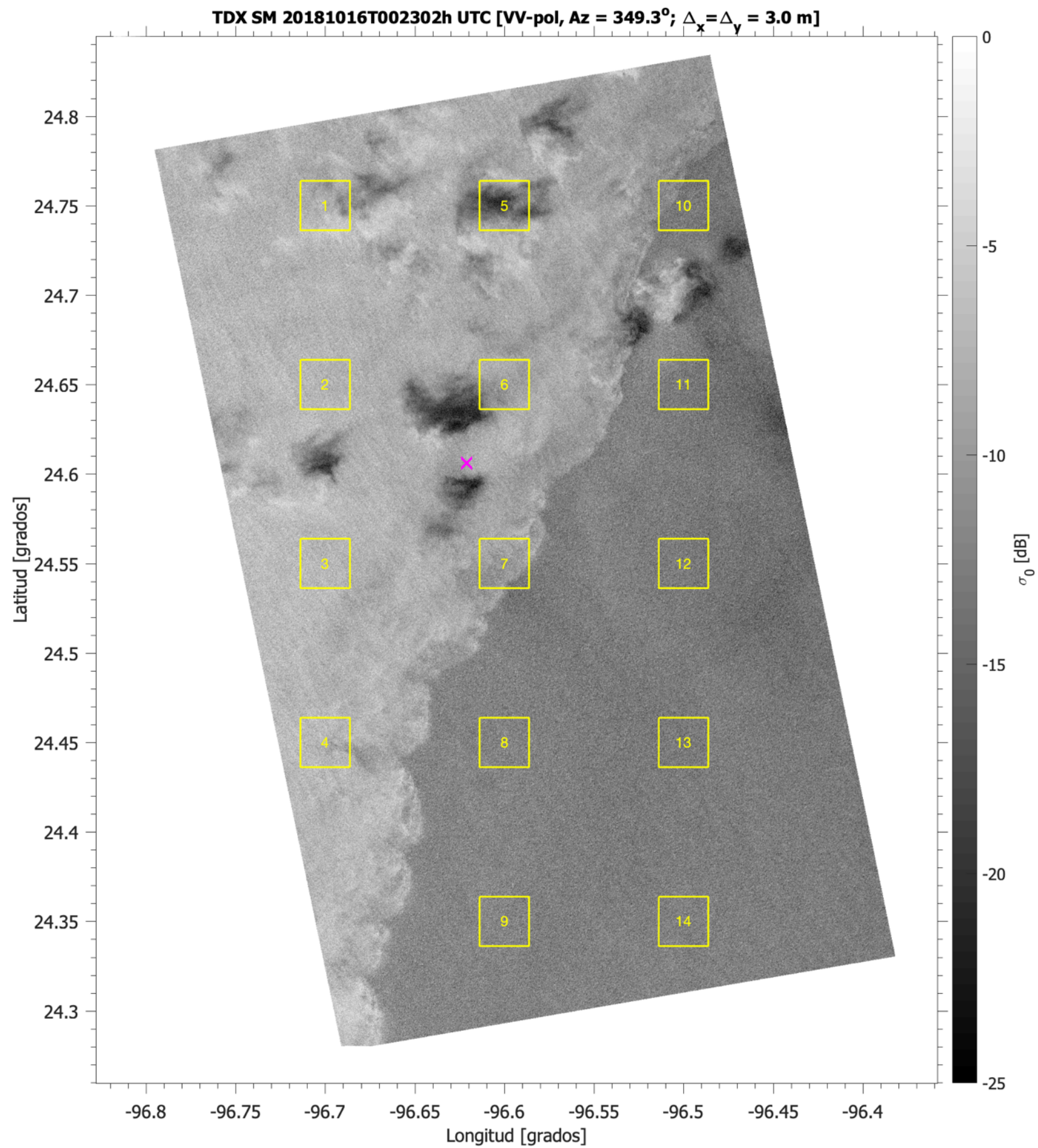
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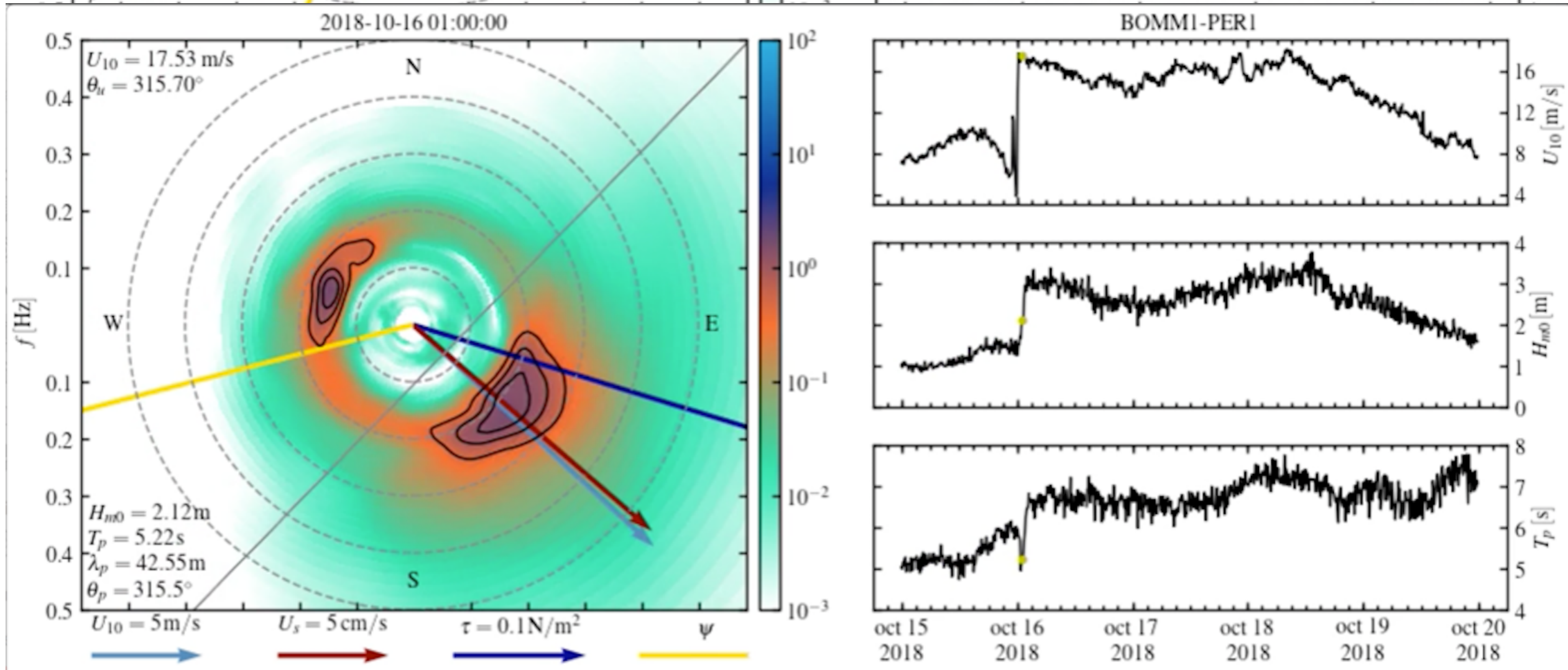
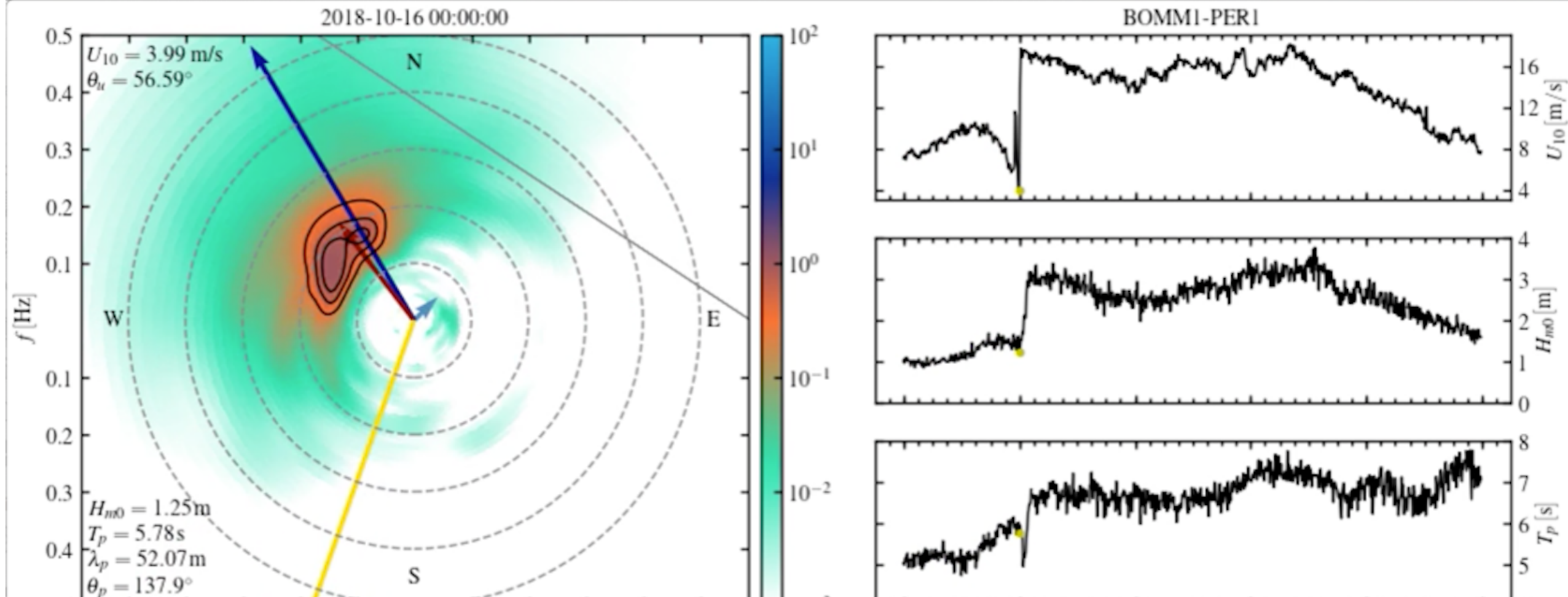
24.5

24.45

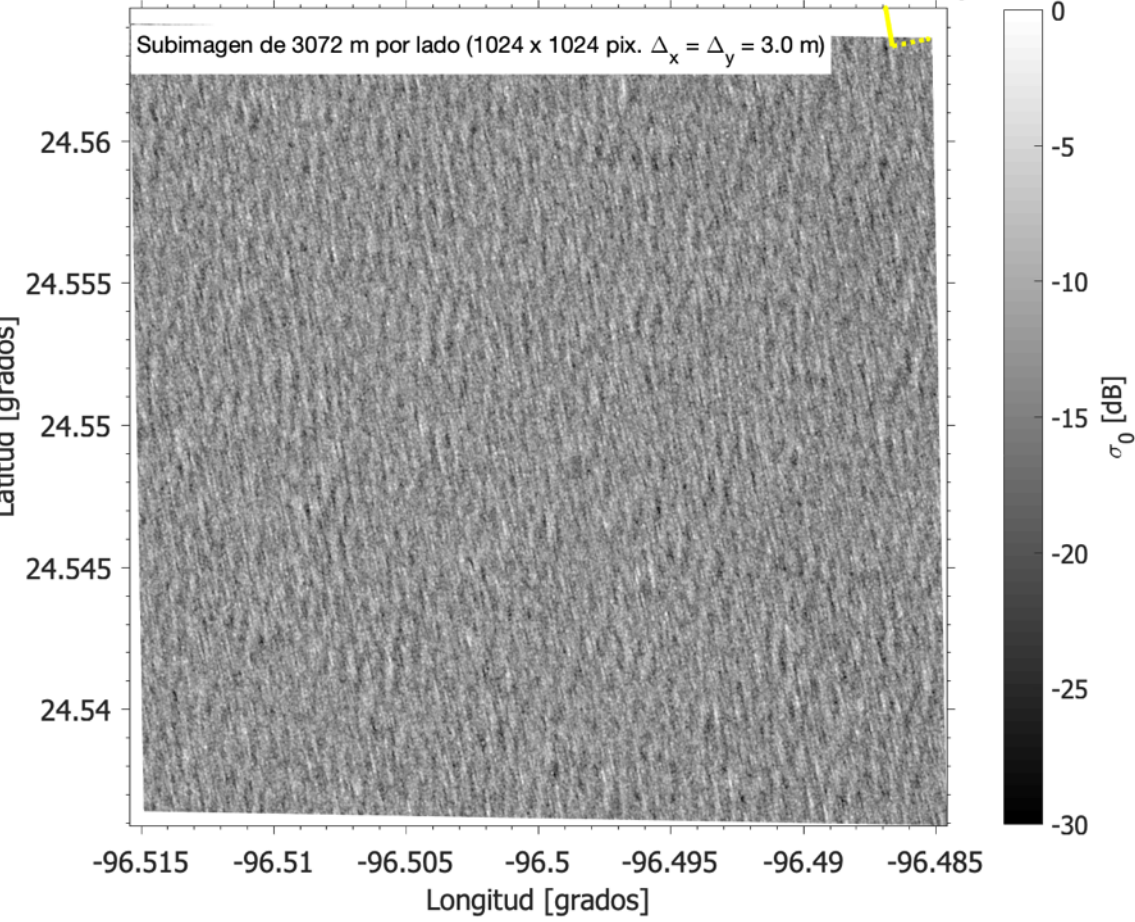
24.4

TDX_SM_20181016T002302

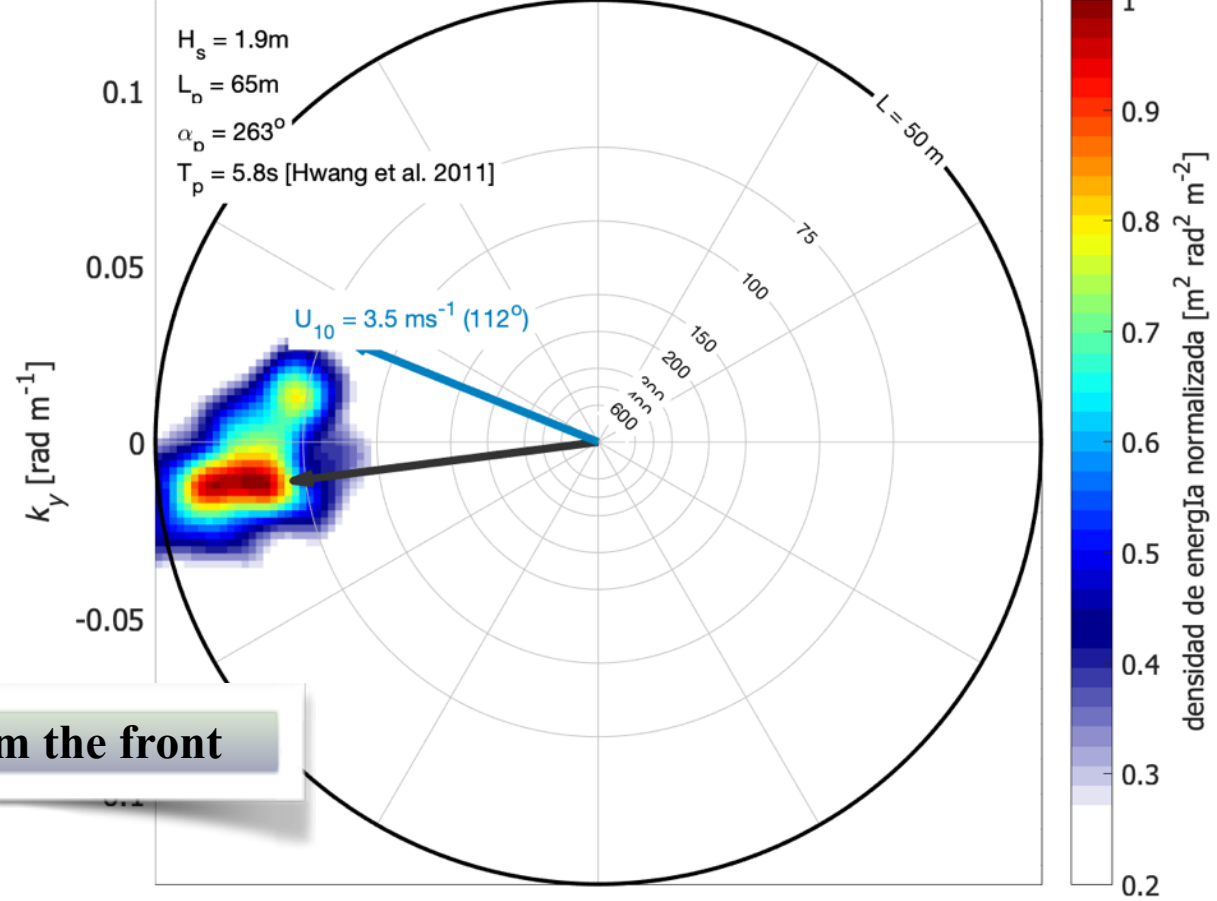




12. TDX SM, VV-pol - 20181016T002302 UTC [24.550° N, -96.500° E], $\theta_i = 27.3^\circ$

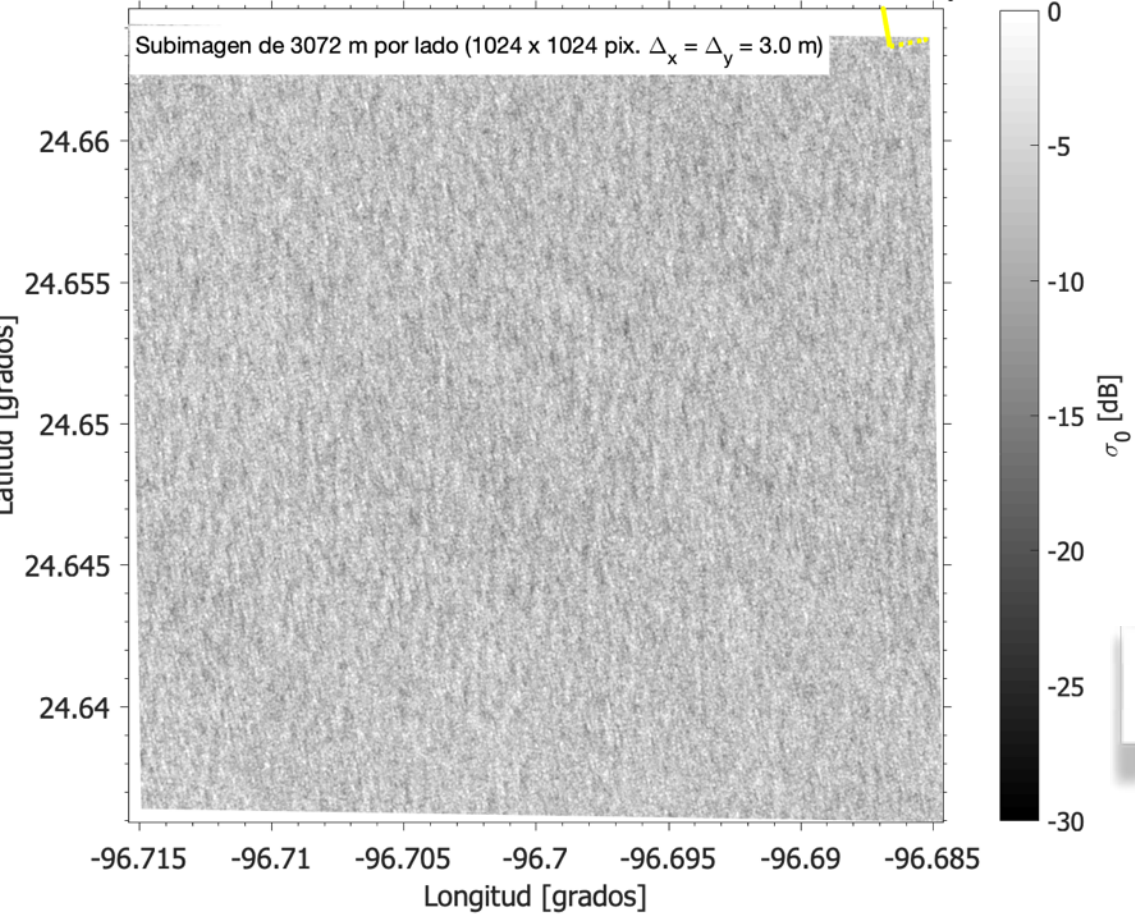


12. Espectro Invertido - SNT1 20181016T002302 UTC [24.5515°, -96.5°]

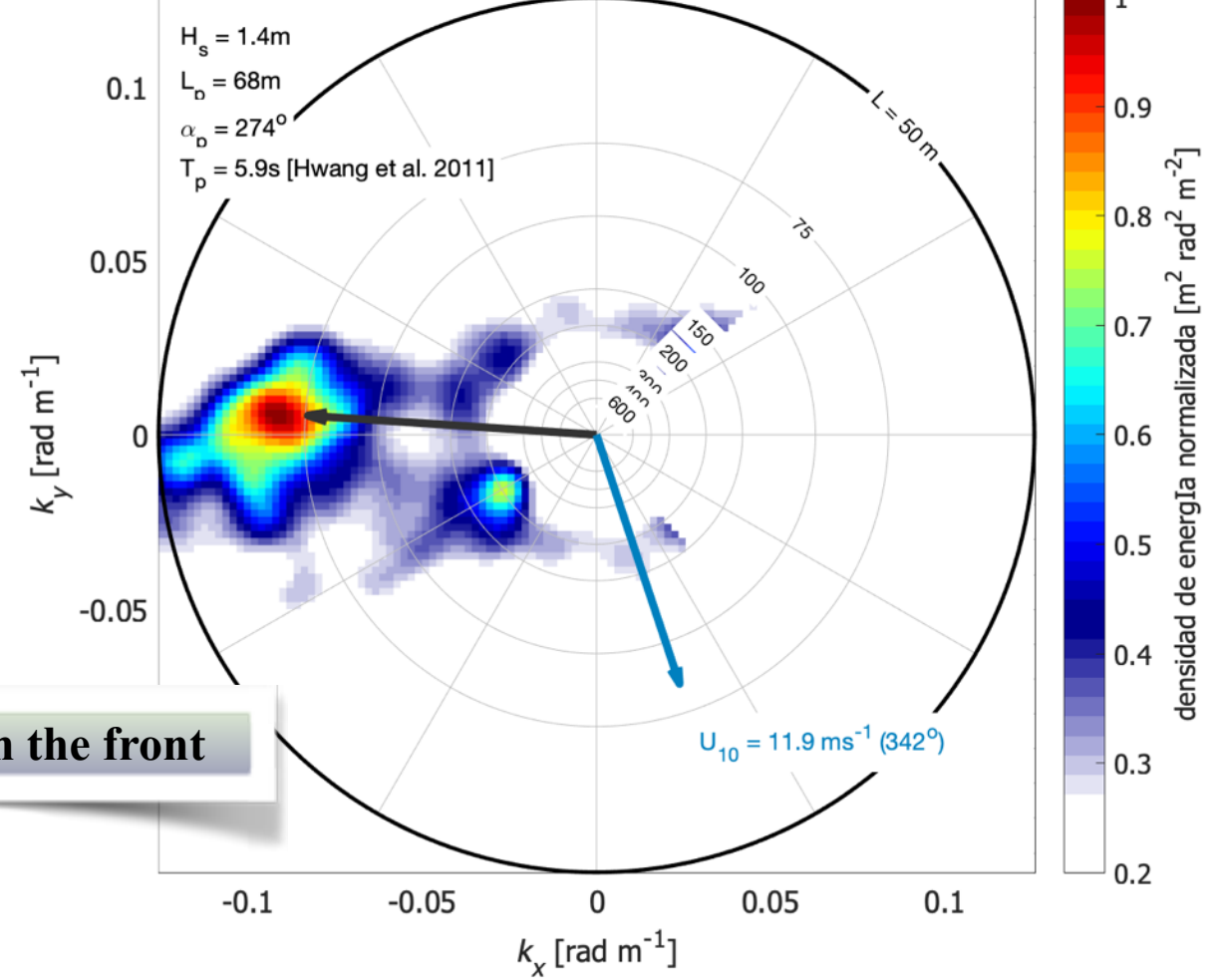


Eastward from the front

2. TDX SM, VV-pol - 20181016T002302 UTC [24.650° N, -96.700° E], $\theta_i = 25.5^\circ$



2. Espectro Invertido - SNT1 20181016T002302 UTC [24.4578°, -96.7°]



Westward from the front



Final remarks and further plans.

- Enhanced spar buoys (own electronic design), multiple sensors.**
- Determination of momentum fluxes through eddy covariance method.**
- Directional wave spectrum and its evolution.**
- First results from SAR image to retrieve wave information, under atmospheric front. Spatial variability to be studied. Buoy and SAR wave spectra are complementary.**

Spar buoys essential for Cal/Val super sites.

Recover buoys, maintenance, include CO₂ sensors and stereo cameras.

Inversion algorithm to retrieve wave spectrum from SAR images.

Further analysis of recorded data.

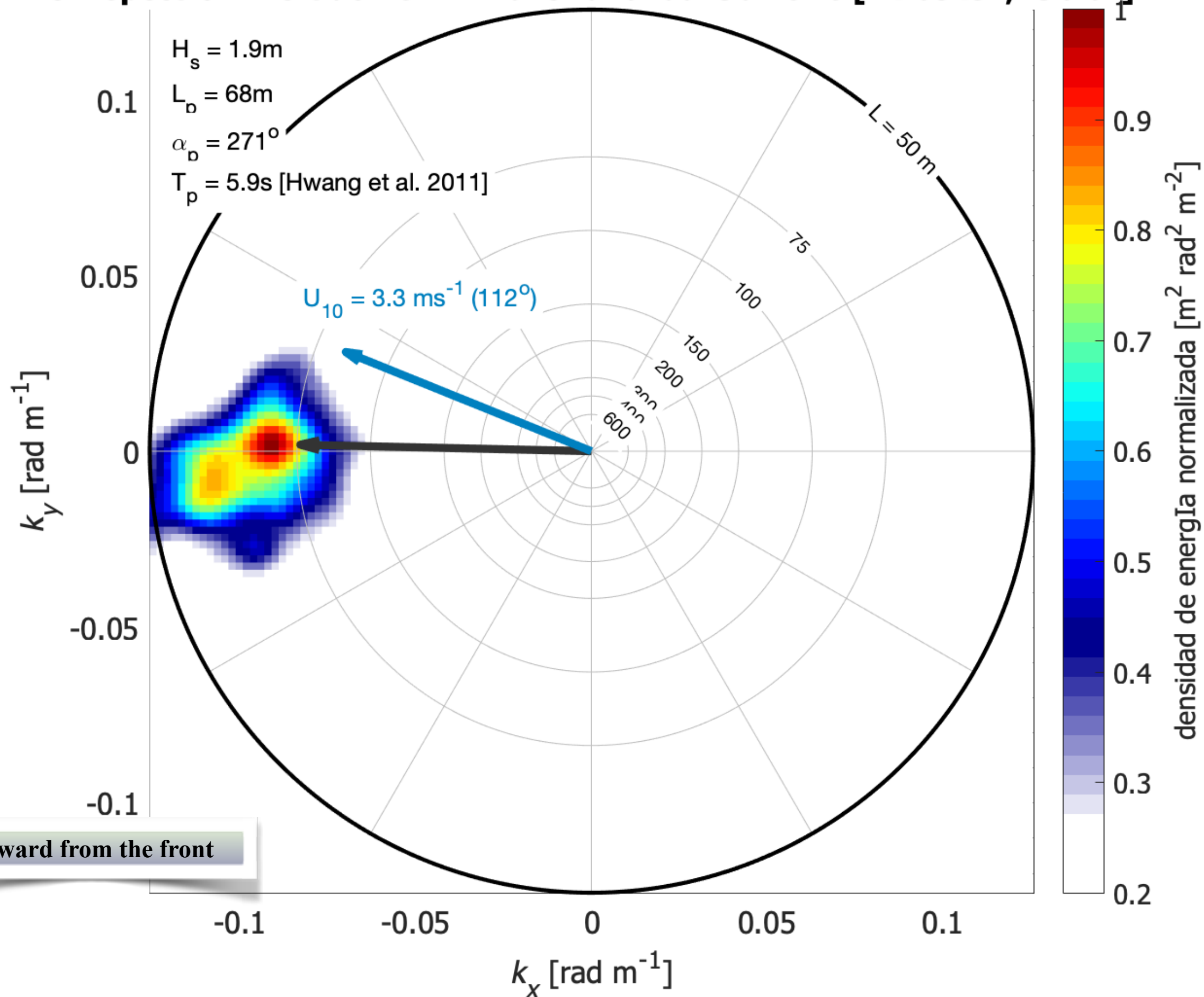
THANK YOU!

Special thanks to Ms. Julieta Castro (Logistics and administrative support)

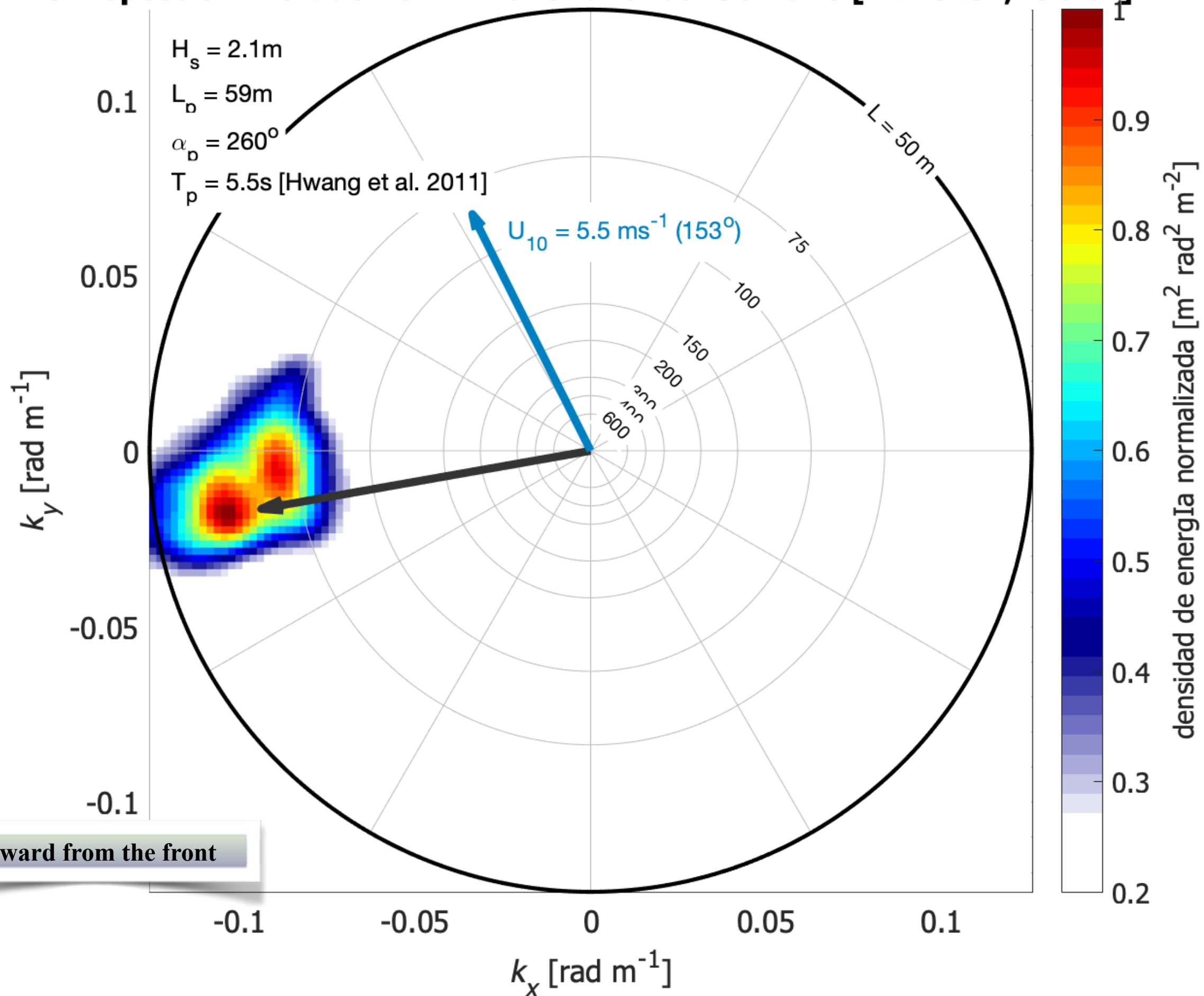
A contribution of CONACYT-SENER 201441 project.

Fundamental research supported by CONACYT CB-2015-01 255377

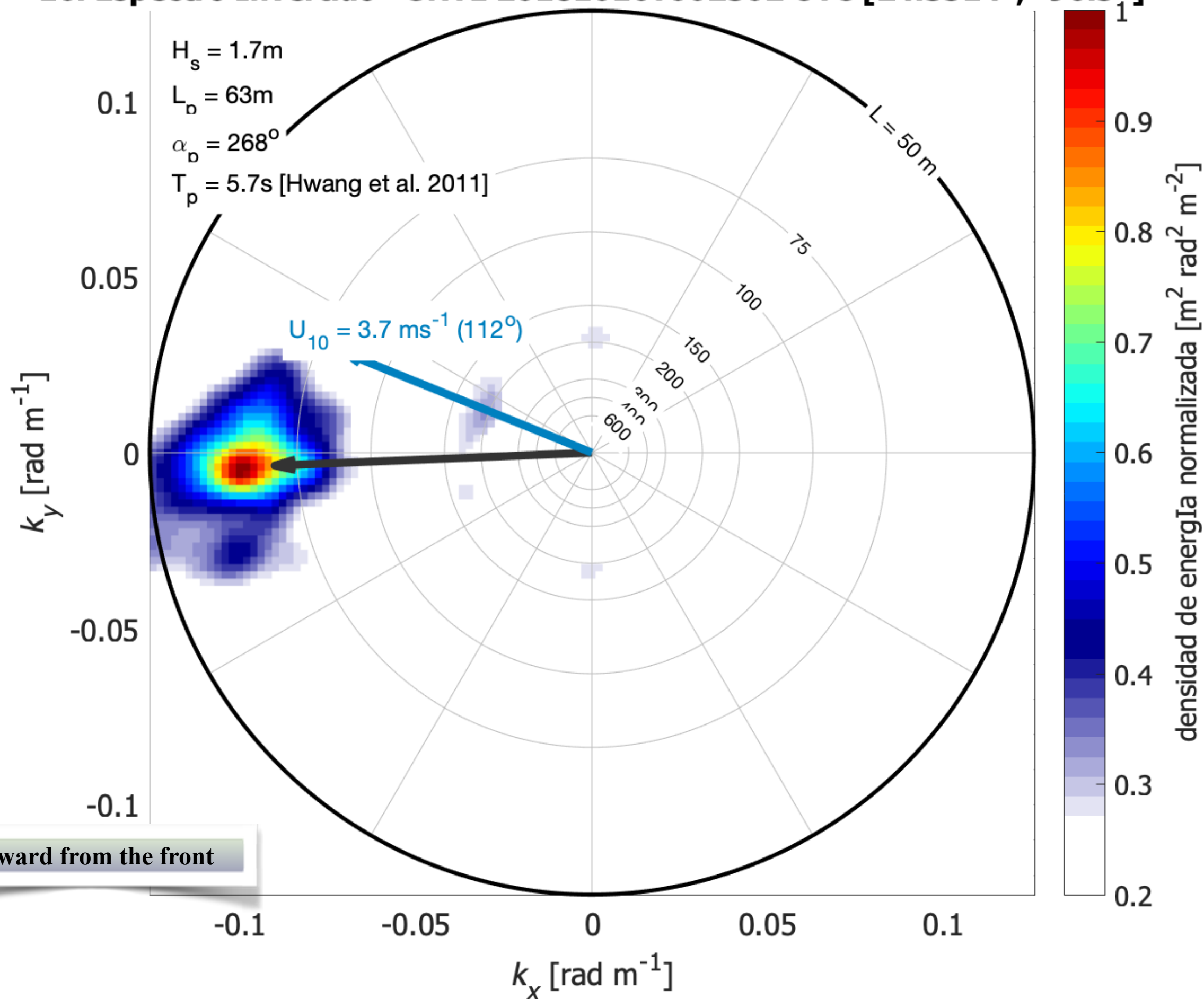
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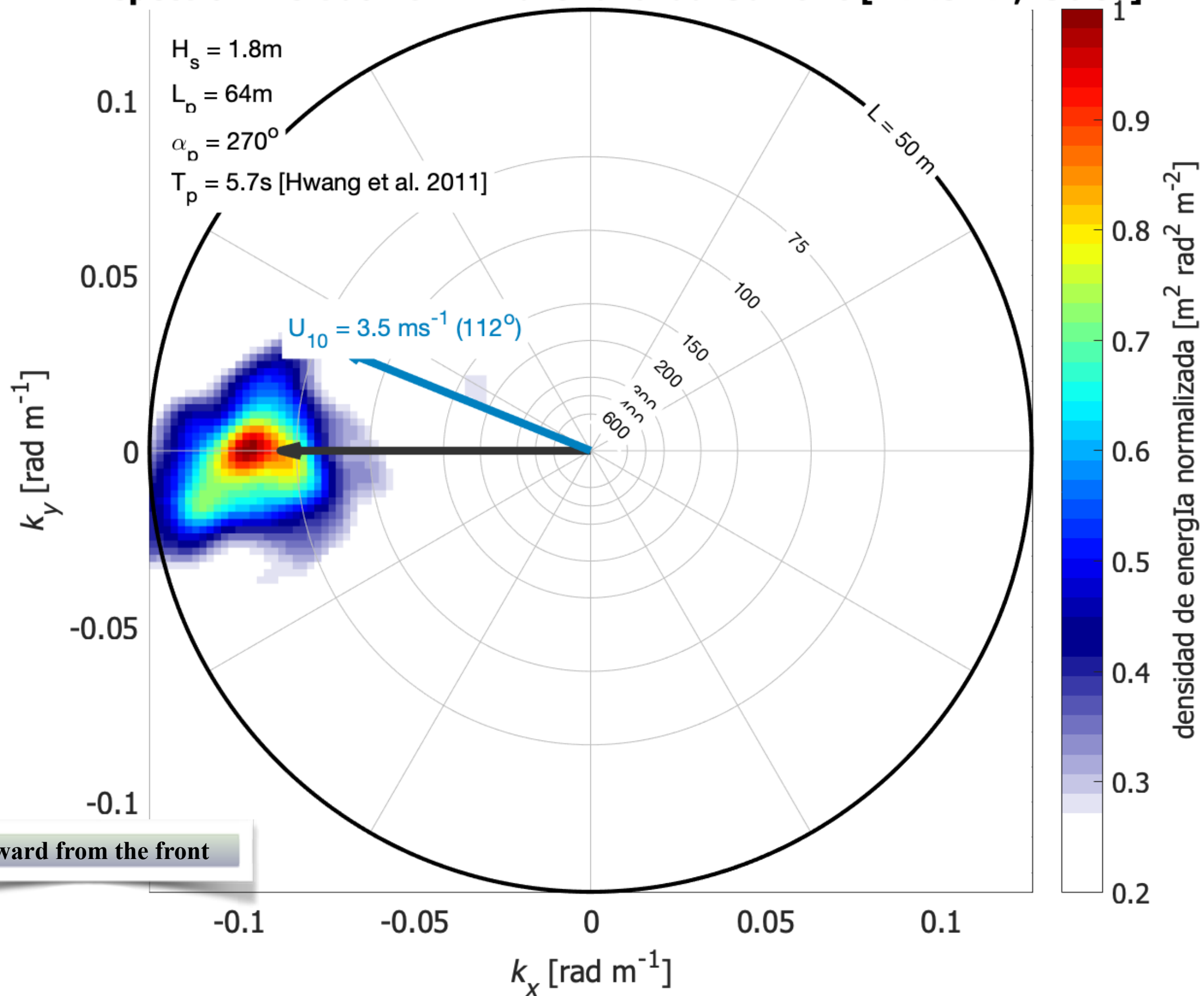
9. Espectro Invertido - SNT1 20181016T002302 UTC [24.7549°, -96.6°]



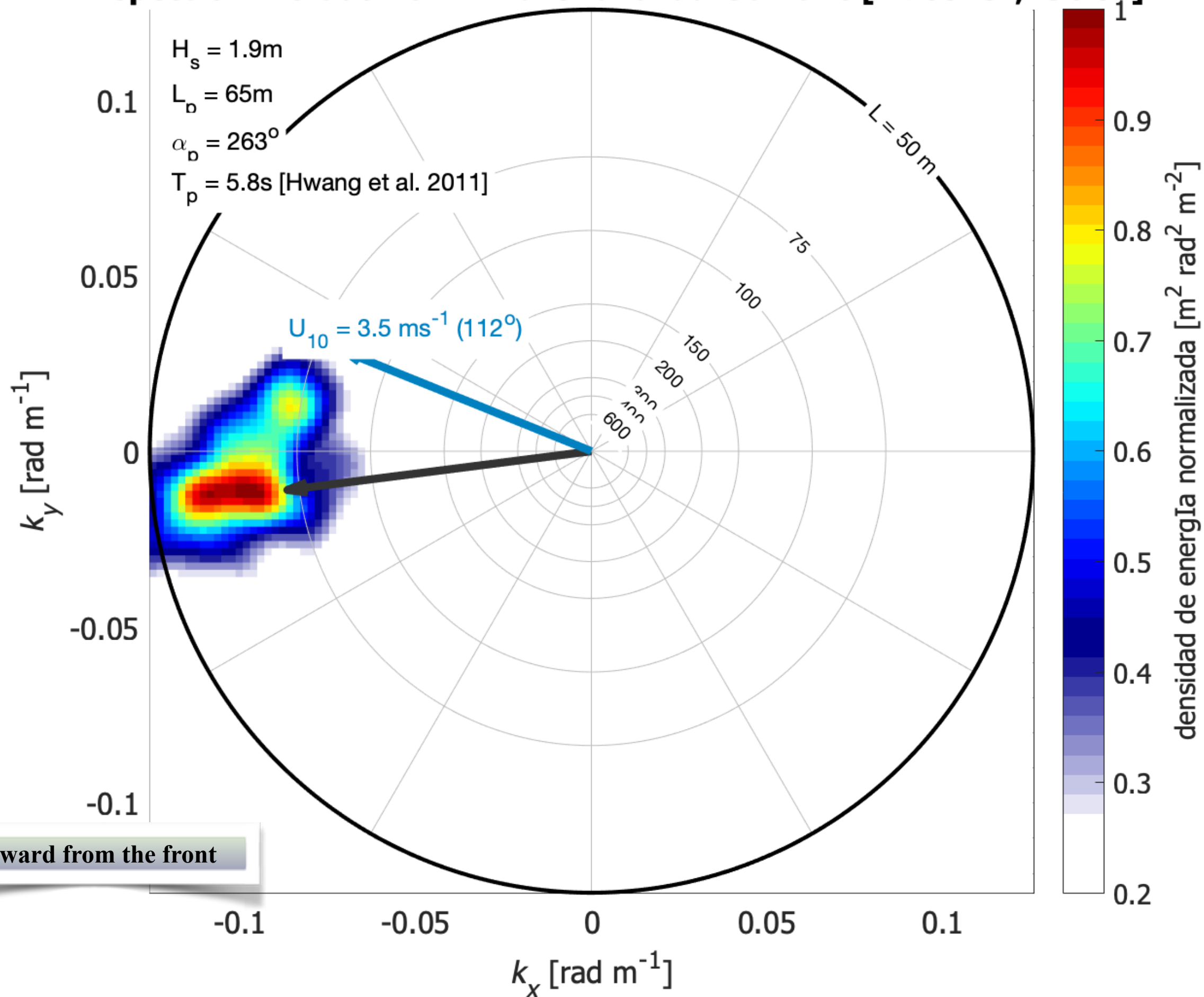
10. Espectro Invertido - SNT1 20181016T002302 UTC [24.3514°, -96.5°]



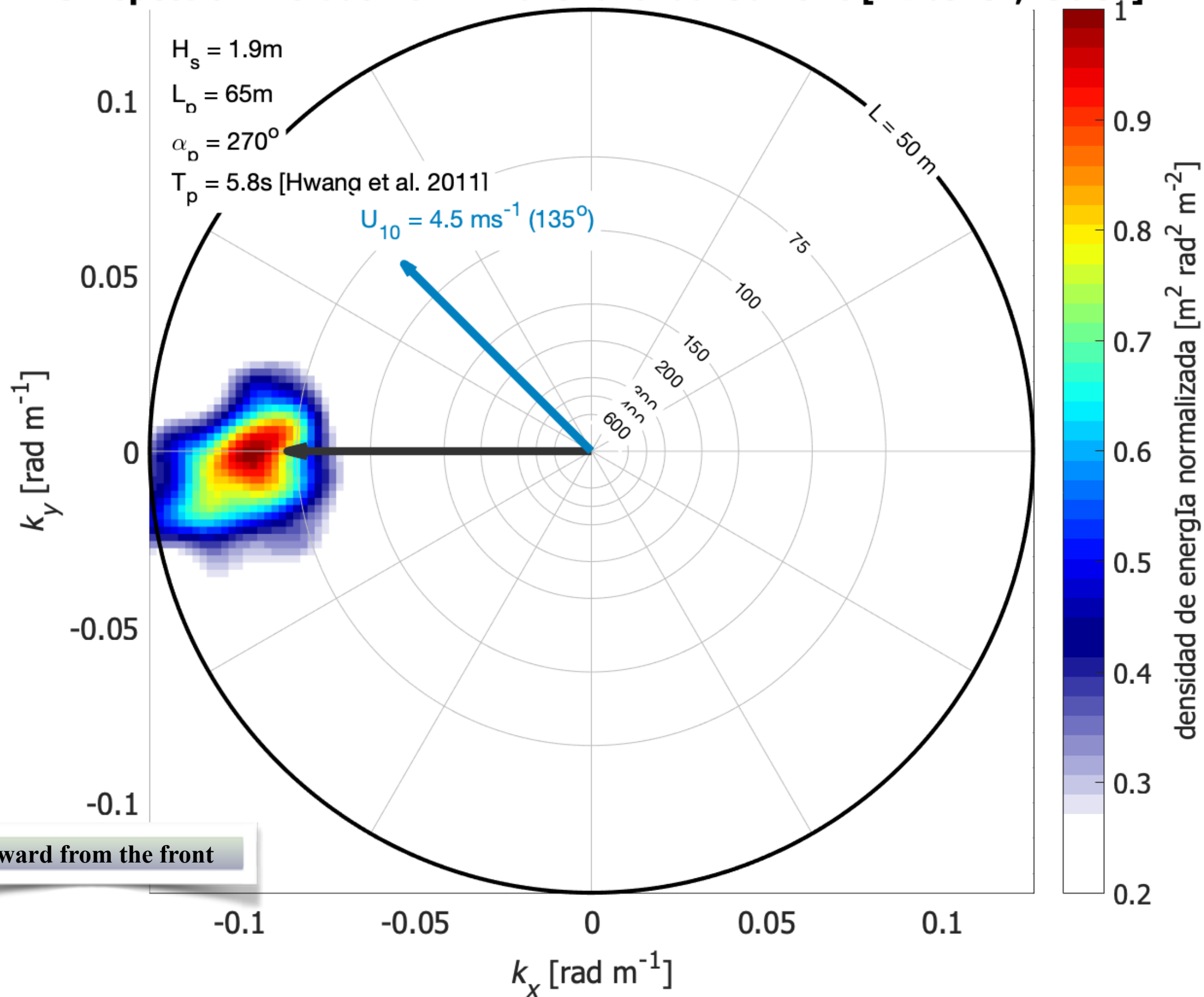
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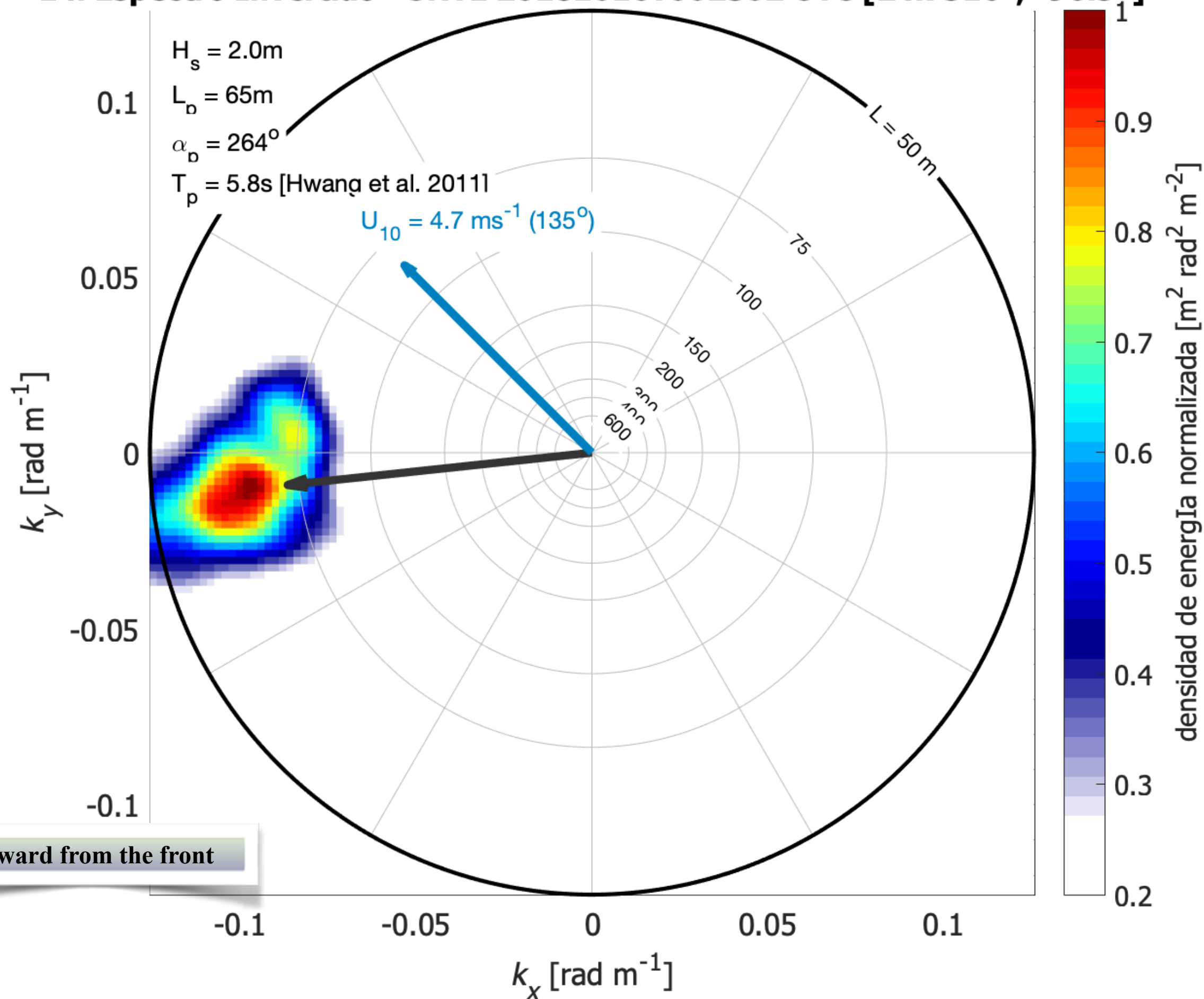
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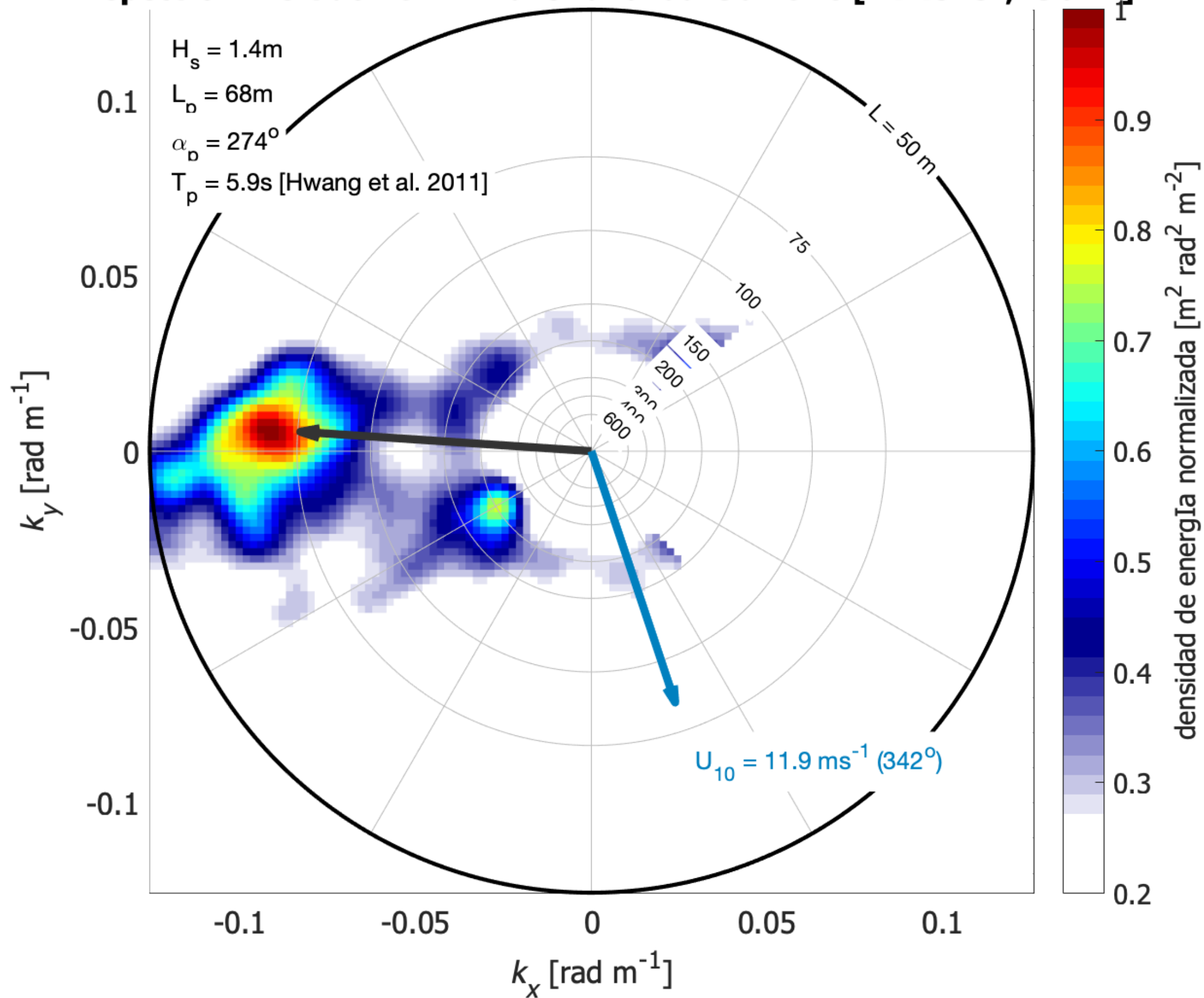
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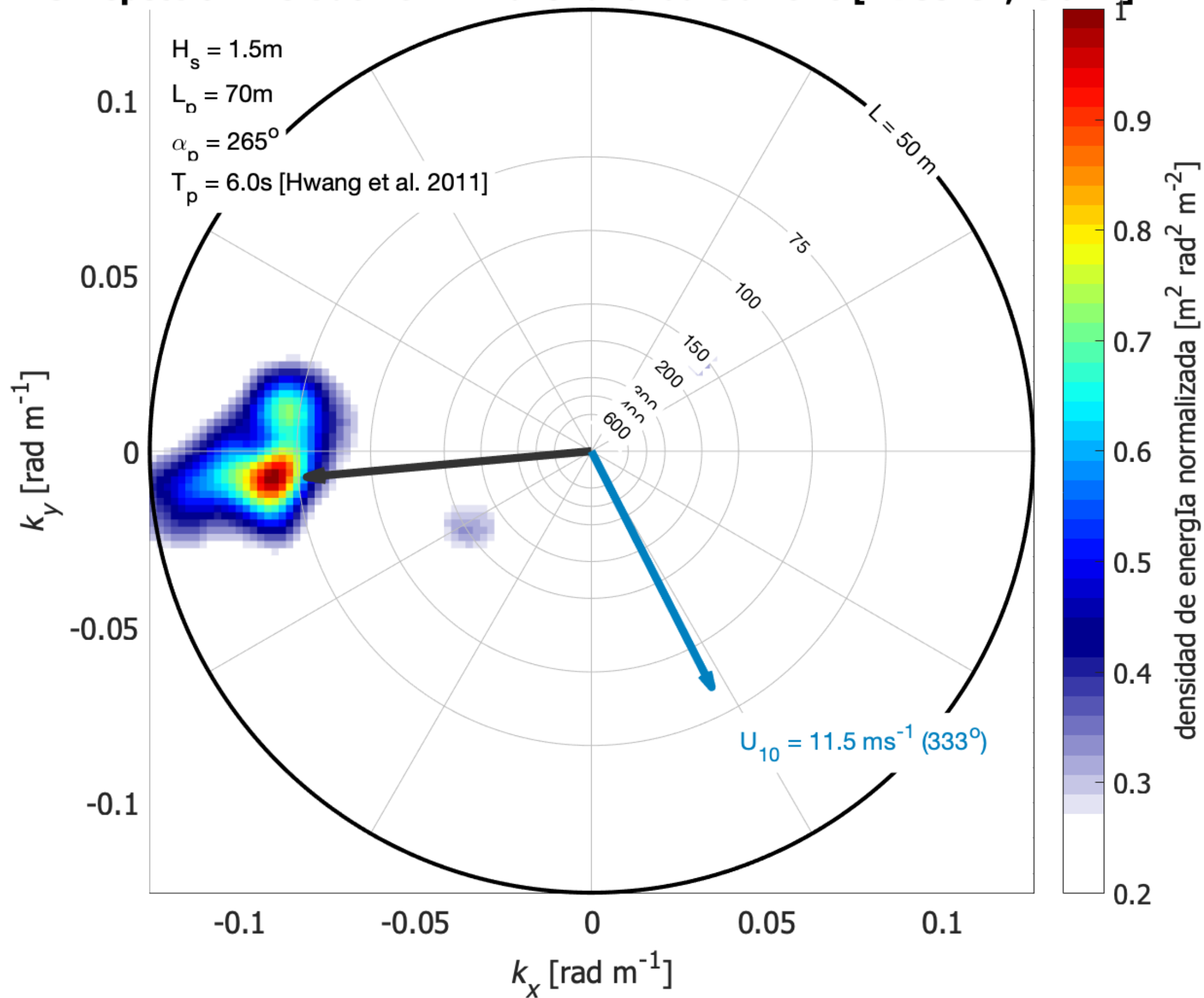
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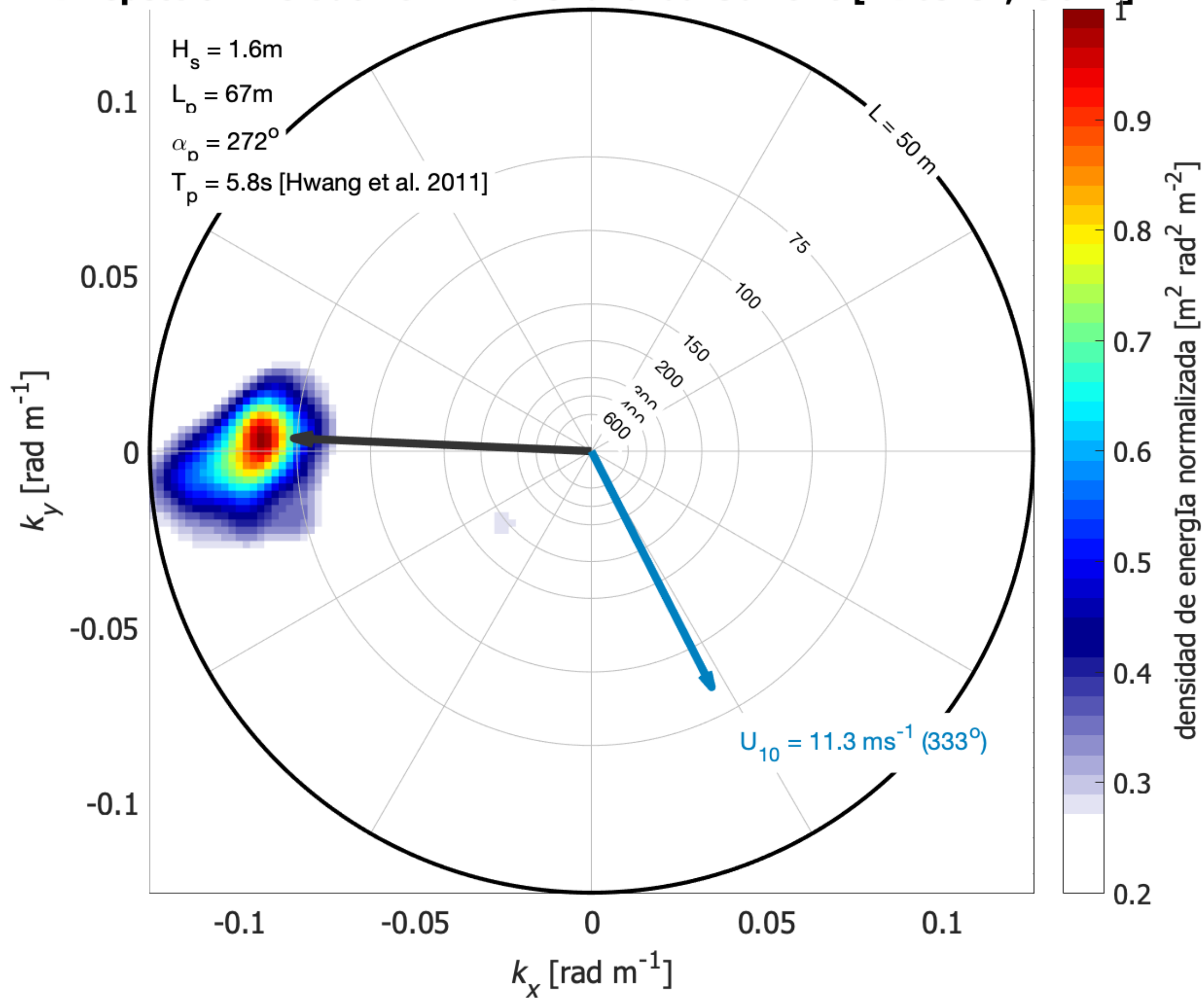
2. Espectro Invertido - SNT1 20181016T002302 UTC [24.4578°, -96.7°]



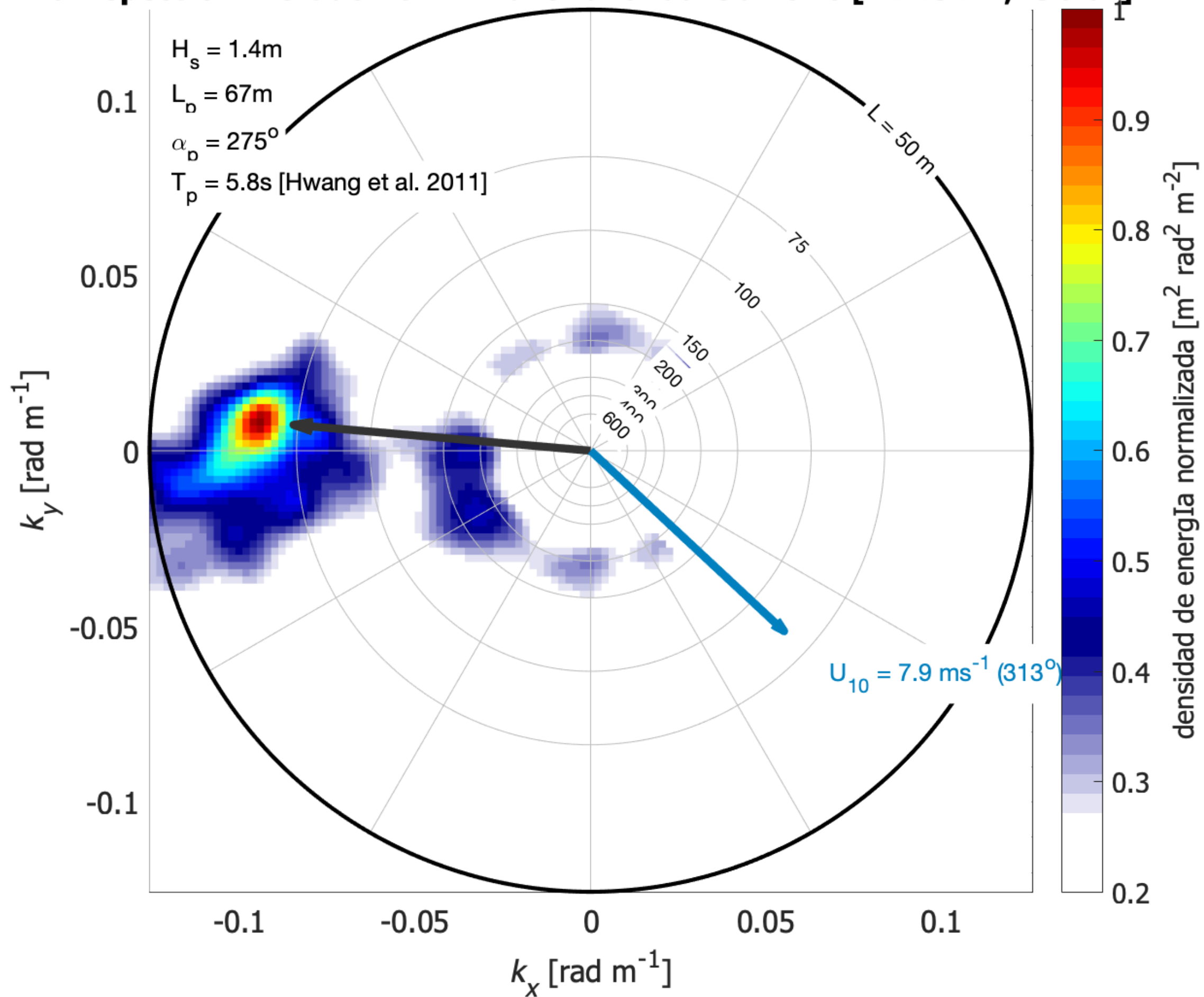
3. Espectro Invertido - SNT1 20181016T002302 UTC [24.5579°, -96.7°]



4. Espectro Invertido - SNT1 20181016T002302 UTC [24.6579°, -96.7°]



6. Espectro Invertido - SNT1 20181016T002302 UTC [24.4547°, -96.6°]



7. Espectro Invertido - SNT1 20181016T002302 UTC [24.5548°, -96.6°]

