

Island trapped waves (ITWs) as a driver of primary production at Lastovo island (Adriatic Sea)?

Z. Ljubešić, Ž. Kovač, M., Orlić, H. Mihanović, D. Lučić, H. Čižmek, B. Čolić, D. Viličić

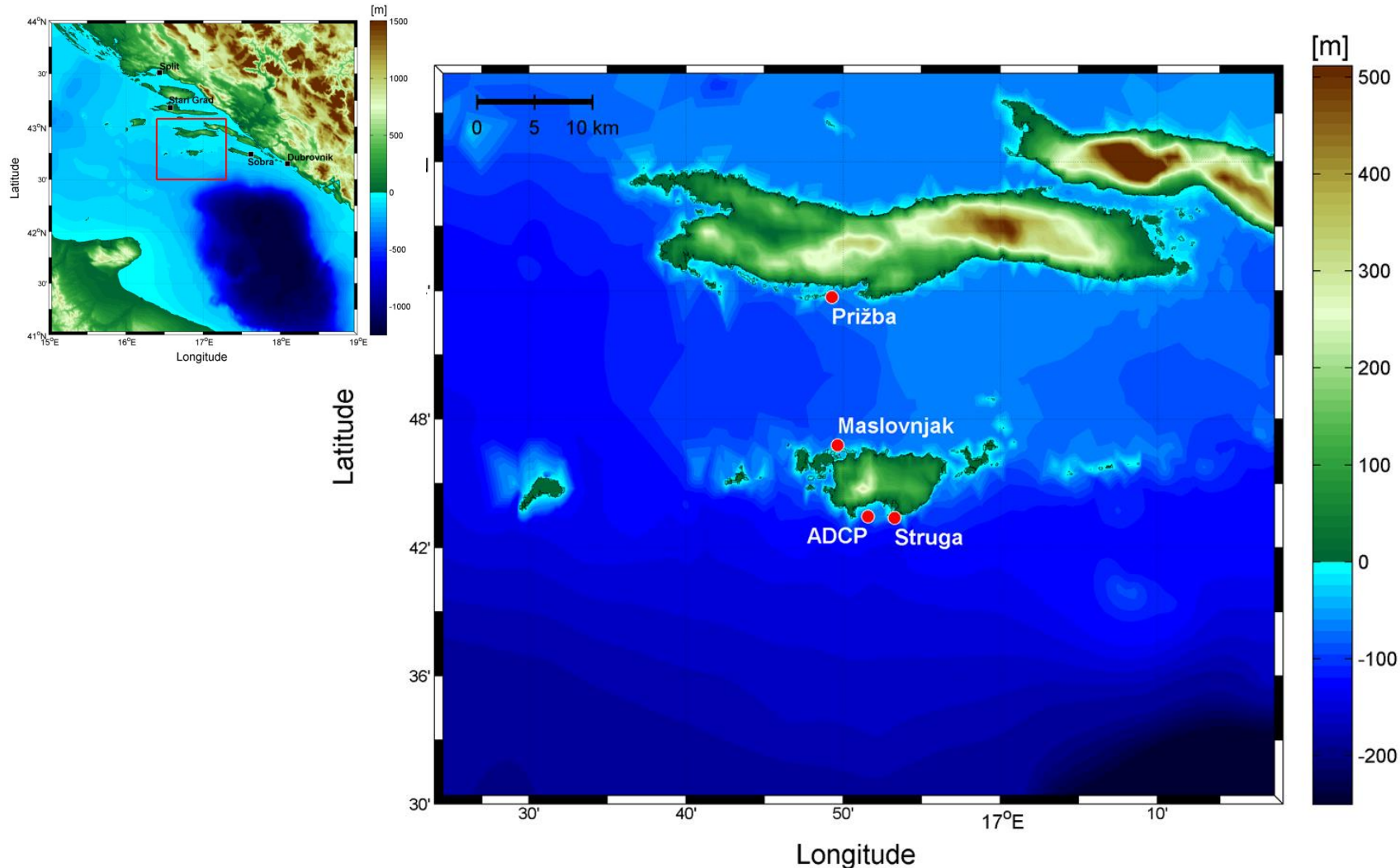


Faculty of Science, University of Zagreb, Croatia

- Internal waves - ubiquitous phenomenon in the ocean; their effect on primary production has seldom been studied
 - internal waves around islands: a peculiar case of coastal trapped internal waves which occurs around closed shoreline
- island geometry and stratification coincide with external forcing → ITWs can be excited → case study –
- Northern hemisphere Island Lastovo



Map of the investigated area in the Adriatic Sea (Lastovo and Korčula islands, June – September 2021)



Temperature loggers:

- Prižba (5 m : 5 m: 45 m, except 25 m)
- Maslovnjak (5, 10, 15, 30, 40 and 45 m)
- Struga (5, 10, 20, 30, 35 and 45 m)
- Early June – late September 2021
- dt = 5 min

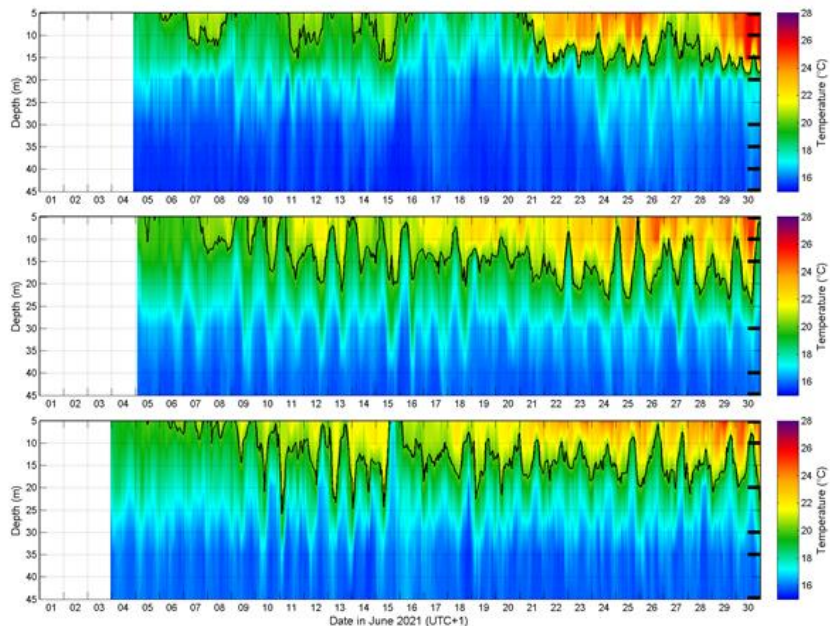
ADCP (300 kHz):

- Early June – early October 2021
- bin depths: 11 m : 4 m : 83 m
- dt = 10 min

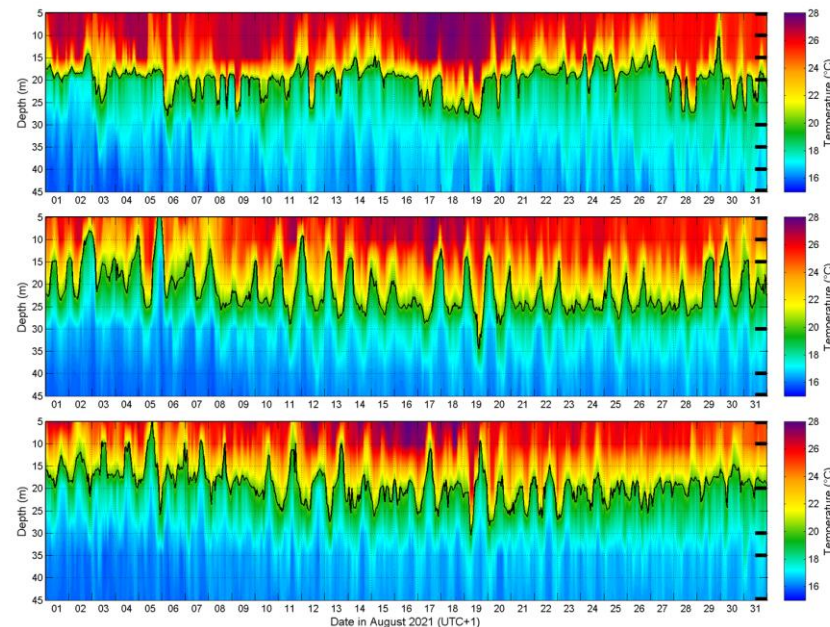
In July 2021 - Ship-based survey at Struga

- CTD measurements twice a day, around 06:00 (UTC+2) when deep thermocline was expected at the location, and around 18:00 (UTC+2) when shallow thermocline was expected.

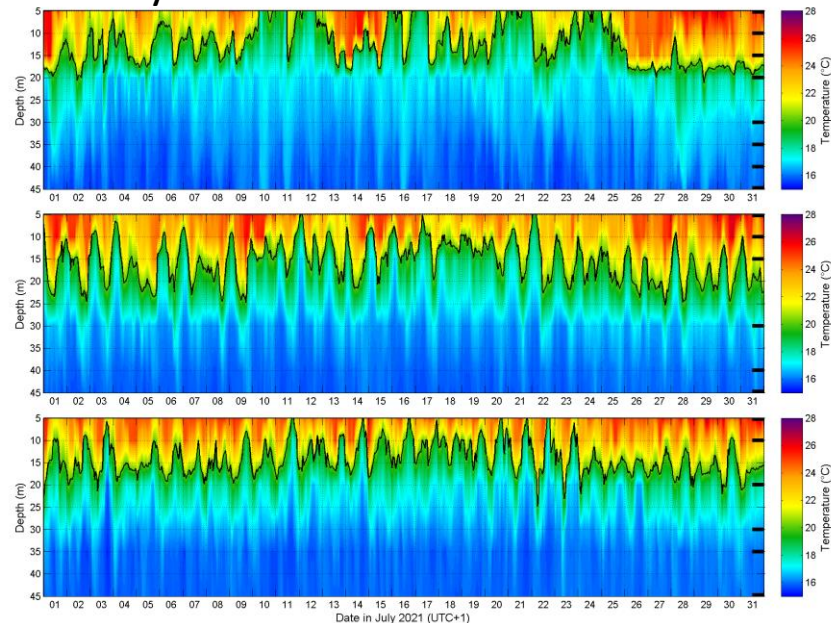
June 2021



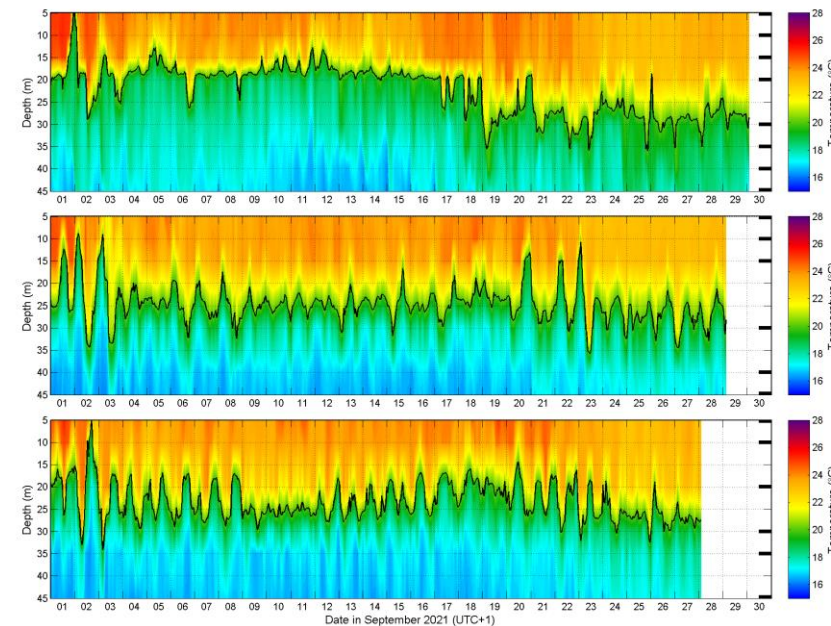
August 2021



July 2021



September 2021



Prižba

Maslovnjak

Struga

Temperature oscillations at opposite sides of the island off phase, indicating the clockwise propagation of the internal waves around the Lastovo island.

Prižba

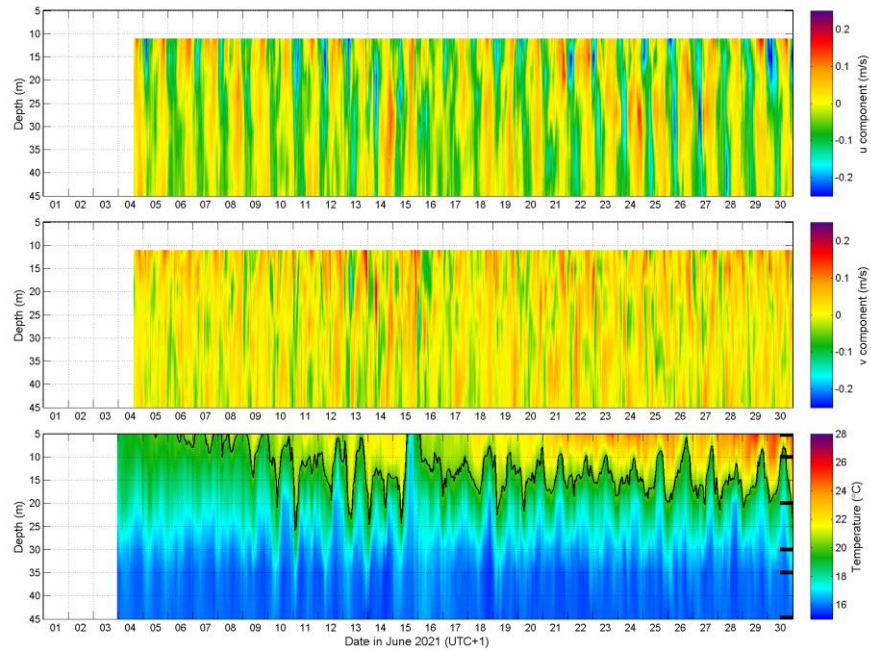
Maslovnjak

Struga

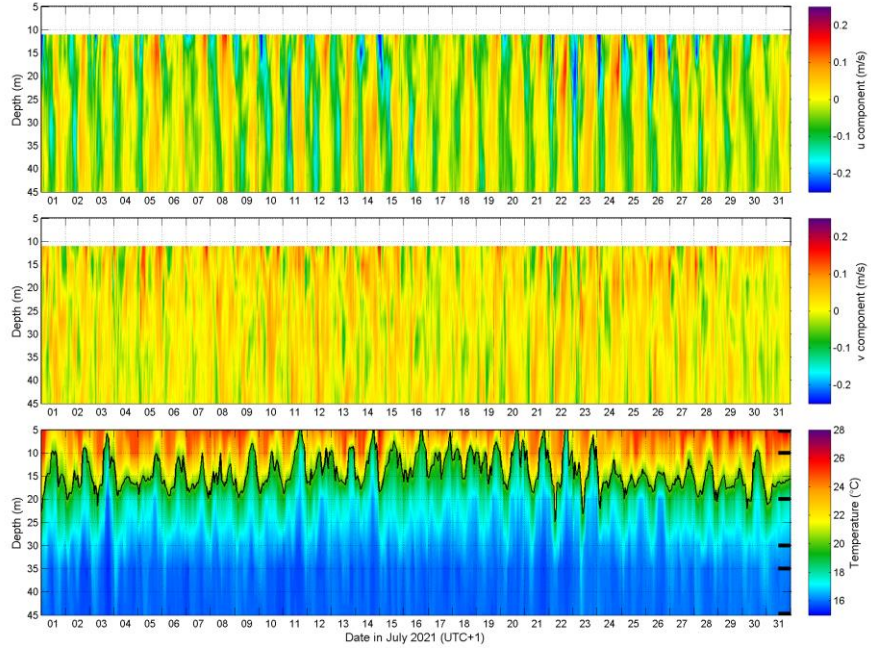
Several episodes with large diurnal thermocline oscillations, with range surpassing 20 m observed.

Temperature - 20°C isotherm denoted

June 2021



July 2021

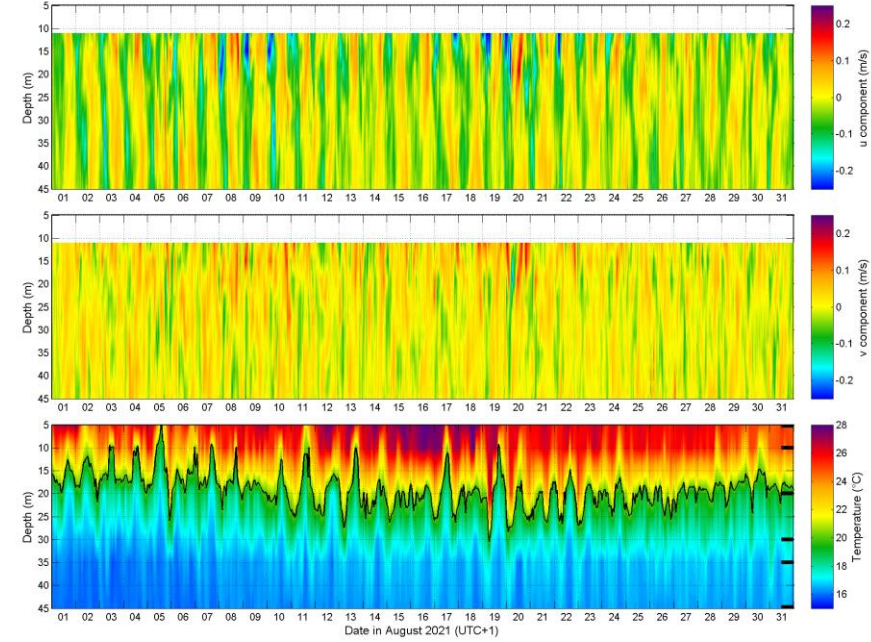


ADCP
u component

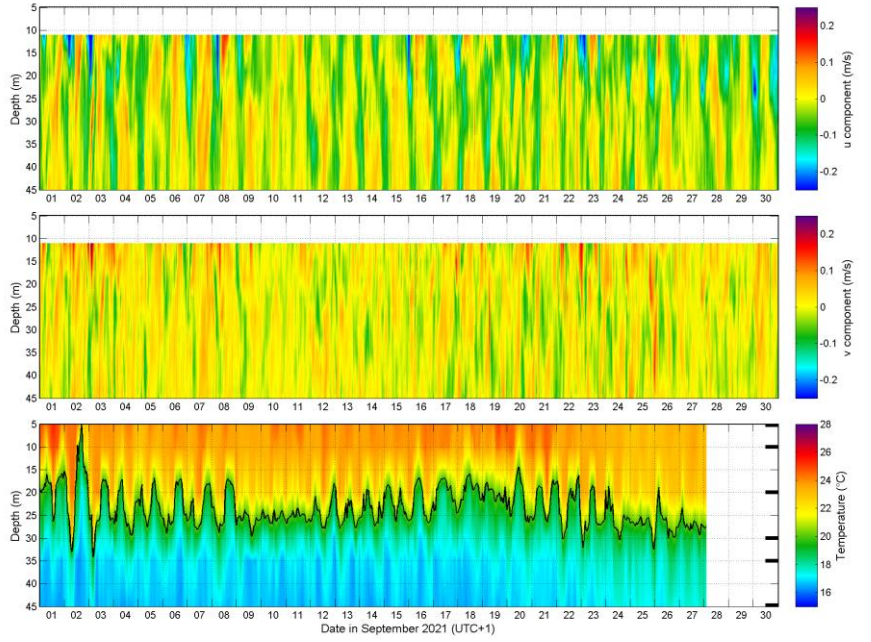
ADCP
v component

Struga temperature

August 2021



September 2021

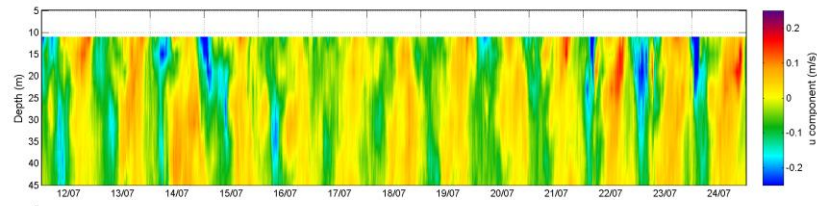


ADCP
u component

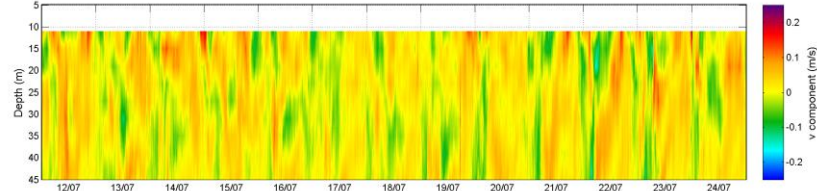
ADCP
v component

Struga temperature

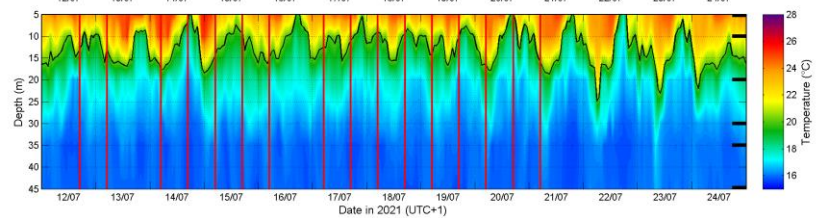
ADCP
u component



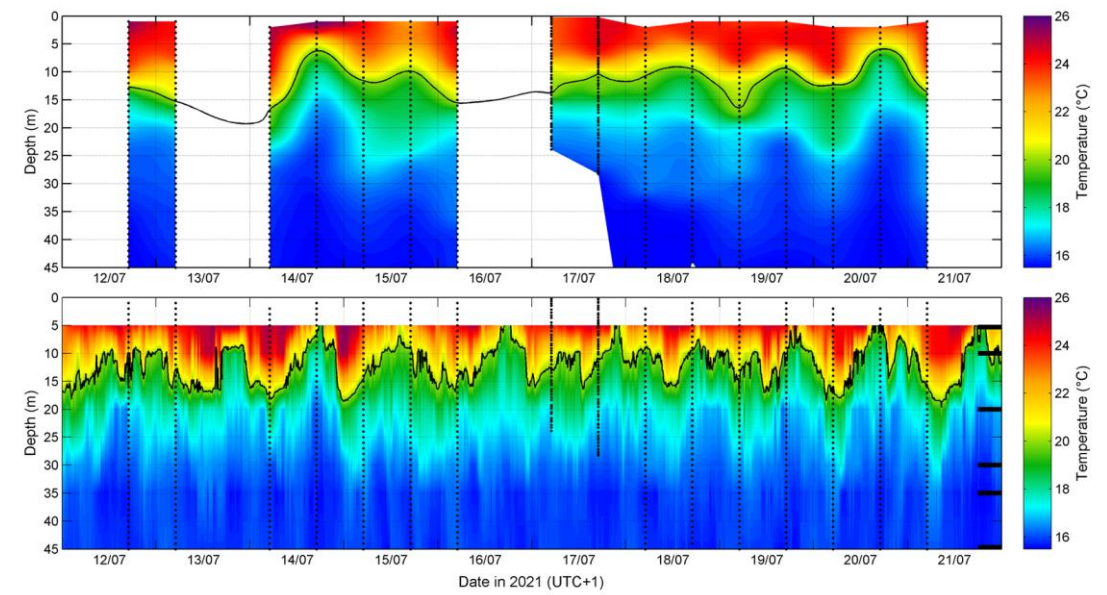
ADCP
v component



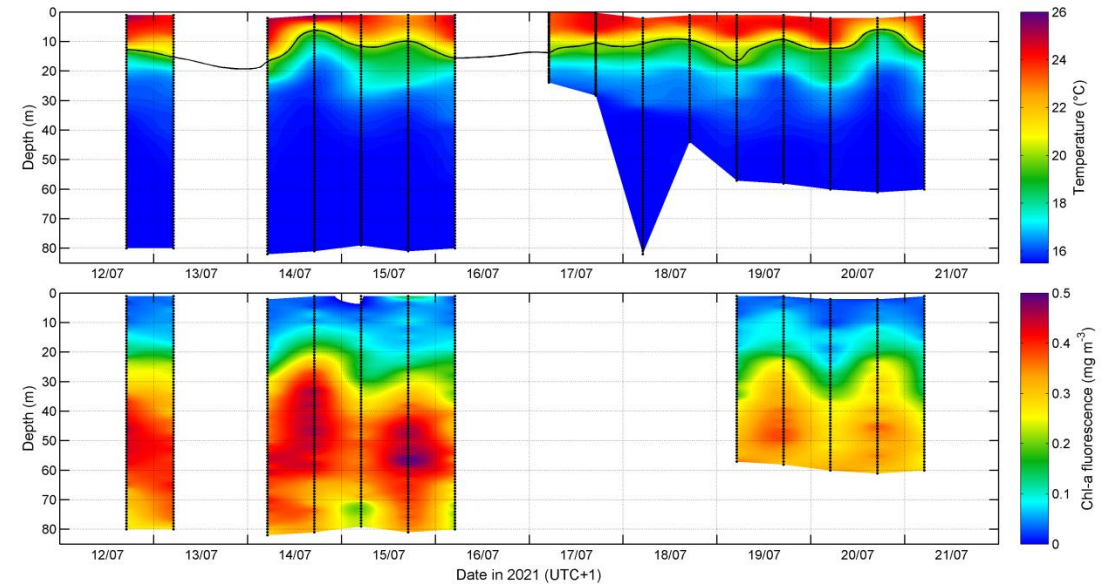
Struga CTD profiles
denoted (red lines)



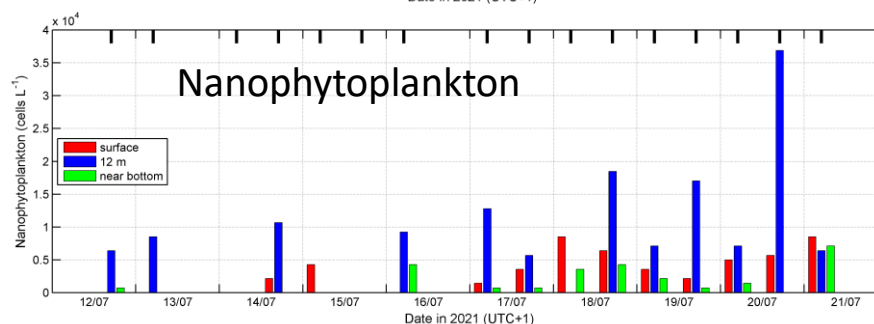
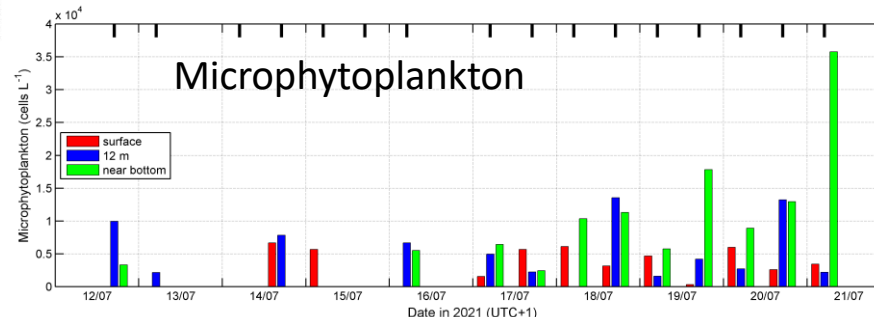
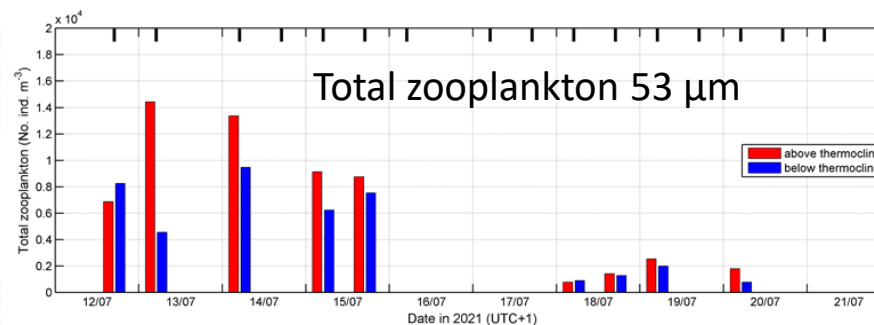
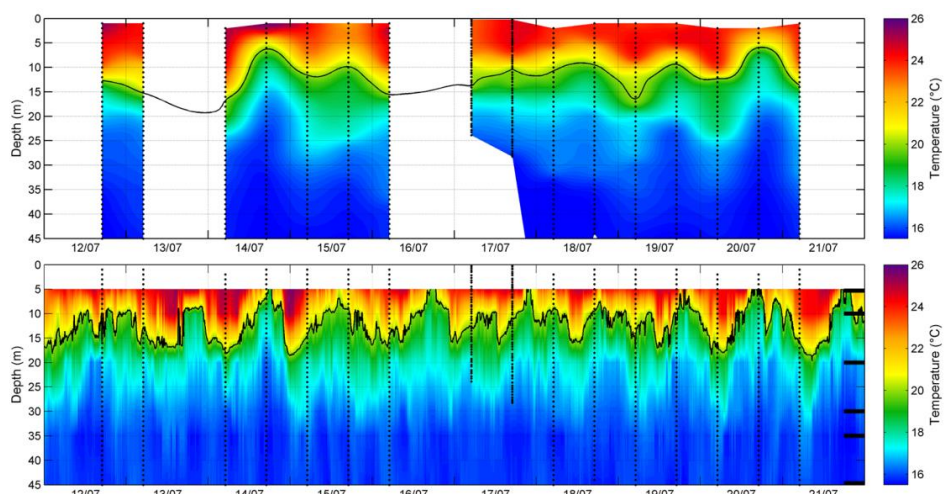
- Deep chlorophyll maxima in the 40–60 m depth layer were following thermocline oscillations
- CTD temperature measurements showed that the ITW range was decaying away from the coast.
- Complementary to the CTD measurements, discrete water nutrient and plankton (bacterio-, phyto- and zooplankton) samples were taken for further analysis



CTD vs loggers (July 2021)



CTD temperature and chl-a (July 2021)



First observations:

- Change of phytoplankton community
dinoflagellates/diatoms
- regime shift in
phytoplankton and
zooplankton abundance
- Strong microbiological
activity in the thermocline
– nanoplanktonic
dinoflagellates

Questions to be answered in next 3 years:

1. Diurnal thermocline dynamics under stratified conditions supply nutrients which fuel primary production?
2. Application of novel in situ platforms and sensors allow us to develop a mechanistic and quantitative understanding of the physical oceanographic processes that support primary productivity through nutrient transport ?
3. ITWs make an important contribution to primary productivity in Lastovo archipelago?