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Oceanographic study of the Subarea 48.6 with sea-surface temperature (SST) anomaly and vertical profile of sea temperature (PST)

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Abstract

The Oceanographic study of the Subarea 48.6 on the SST, SIC, PST, current and wind vector was conducted. The lower SST corresponded to the higher SIC and vice versa. The PST indicates the mixed layer depths in research block5. The currents around the research block 4 and 5 were indicated. It is found out that there is a relationship between the SST and the wind. The CTD vertical profile data collected by Tronio should contribute to developing this oceanographic study.

1. Sea Surface Temperature(SST) anomaly(difference from the SST averaged over 2002-present) dynamics of the Subarea 48.6 of Feb. 15th in 2011-2019.(Figure 1)(<https://coastwatch.pfeg.noaa.gov/erddap/index.html>.)

The SST anomaly dynamics of the Subarea indicate that in Feb during 2011-2016 the SST anomalies were negative (of colder mode). From 2017 to 2019, the SST anomalies were positive (of warmer mode). However, SST in 2019, especially the southern part of 48.6 was colder than in both 2017 and 2018.

2. Sea Ice concentration (SIC) dynamics of the Subarea 48.6 of Feb. 15th in 2013-2019.(Figure 2)

(https://seaice.uni-bremen.de/data/amsr2/asi_daygrid_swath/s6250/2019/apr/Antarctic/)

The SIC dynamics of the Subarea indicate that in 2017 and 2018 the SICs were the lowest since 2013 as the SIC started to decreased. In 2019, the SIC tends to increase especially in the eastern part of 48.6(research block _4). The dynamics of SIC agreed well with the SST anomaly dynamics (Figure 1). The lower SST corresponded to the higher SIC and vice versa.

3. Vertical profiles of sea temperature (PST) of Feb.15th both along the line between 10W 70S and 7W 70S in 2018 and 2019 by HYCOM.(Figure 3)

(<https://www.hycom.org/dataserver>)

The profiles indicate that the sea temperature in 2018 at shallower depth than 50m was higher than that in 2019. On the contrary, at the depth range of 50-300m, the sea temperature in 2018 was lower than in 2019. Comparing to the PST in 2018 and 2019, the surface and subsurface layers at 0-300m have changed dynamically. The sea temperature around the surface in 2018 was higher than that in 2019 which correspond to the SST anomaly change in 2018 and 2019 (Figure 1).

The mixed layer depth around research block 5 is probably around 300-500m if the the mixing layer depth can be defined as being 0.5 °C of sea temperature different from the SST. Further detail on the study of the mixed layer depth will be presented in WG-FSA-2019. The SIC and SST by HYCOM have been evaluated both by the SST of NOAA (Figure1) AMSR2 of Uni. of Bremen (Figure2) and and it is found that they corresponds well to each other, so the PST model by HYCOM must be reliable. The CTD vertical profile data collected by Tronio should contribute to developing this oceanographic study.

4. Relationship with SST and other oceanographic valuables such as current of HYCOM(Figure 4) and the south-north component of wind (Figure 5)

(http://tds.hycom.org/thredds/dodsC/GLBy0.08/expt_93.0)

(<https://coastwatch.pfeg.noaa.gov/erddap/griddap/erdQMekm1day>)

Horizontal and vertical dynamics of water affect the PST distribution movement. Figure 4 shows the surface current with SST dated Feb. 15th 2019. The current around research block 5 makes a complex movement along the coast. On the contrary, the majority of the current around the block 4 is westward along the coast. Figure 5 indicates the plot of south-north component of wind of 5 years from 2015 to 2019. This south-north component during Jan.-Feb. in 2019 was more pronounced larger than in 2017 and 2018. Based on the relationship between SST in figure 1 and wind in figure 5, the SST tends to increase as the component of the northward wind decrease.

References

- T. Okuda, T. Namba and T Ichii, 2018, hypothesis in region for 48.6, 58.4.2, and 58.4.1, WS-DmPH-18/06

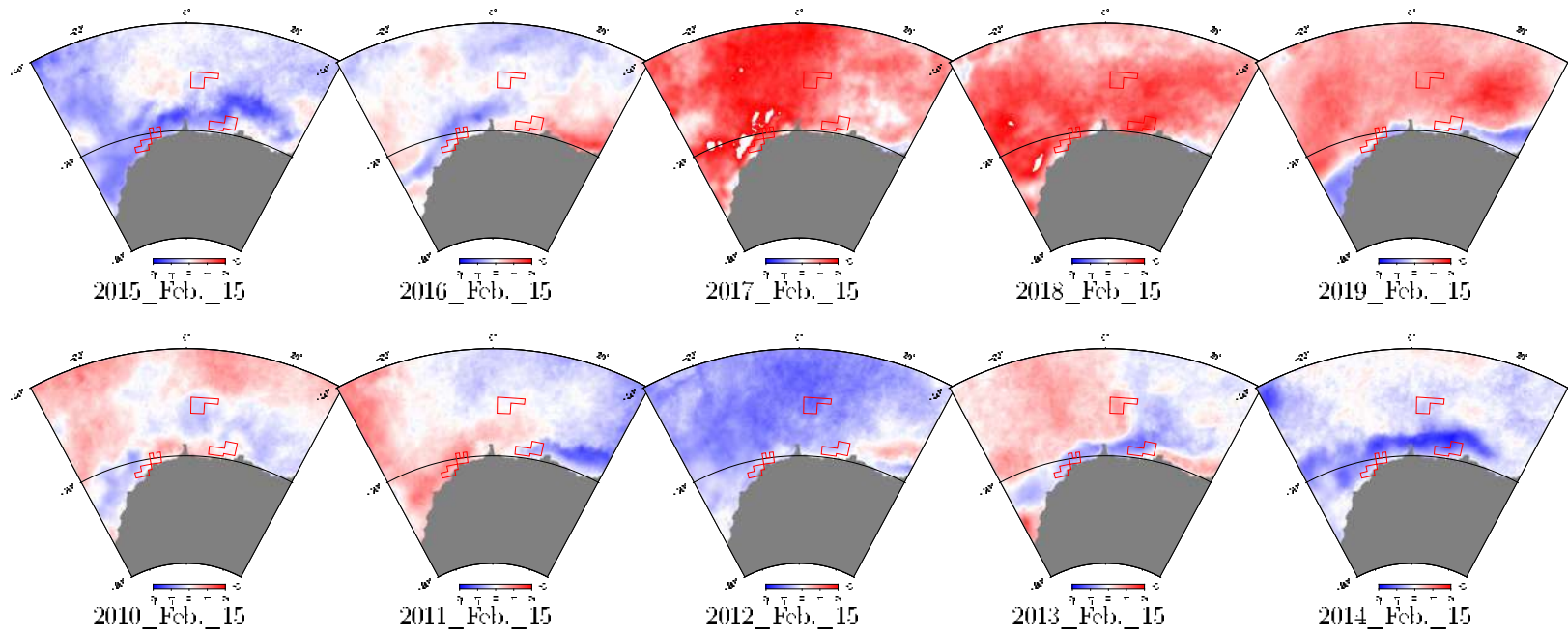


Figure 1 SST anomaly of the Subarea 48.6 in 2010-2019.
(<https://coastwatch.pfeg.noaa.gov/erddap/index.html>.)

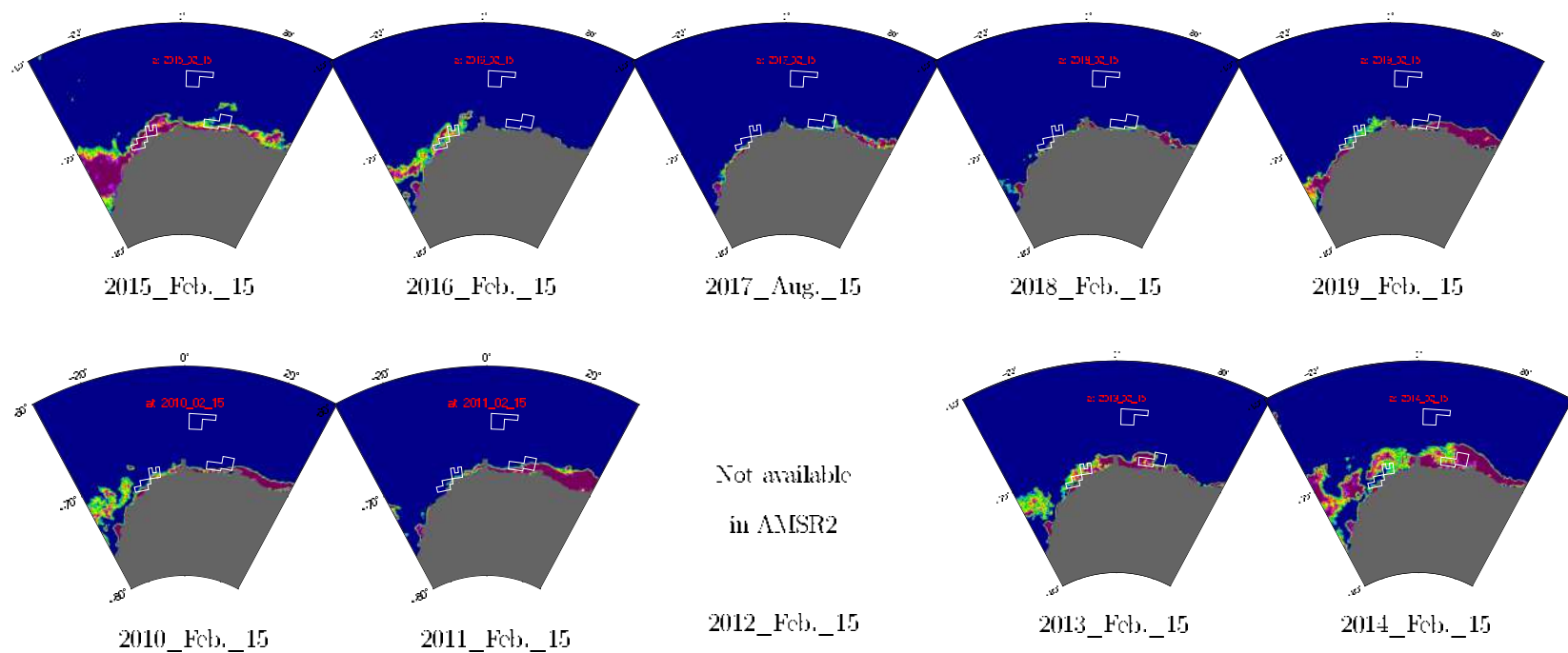


Figure 2 Sea Ice Concentration (SIC) anomaly of the Subarea 48.6 in 2010-2019. From 2010-2011, the AMSR2 isn't available but AMSR-E is available (1 June, 2002 to 4 Oct, 2011 (AMSR-E)) (https://seaice.uni-bremen.de/data/amsr2/asi_daygrid_swath/s3125/2019/apr/Antarctic3125/)

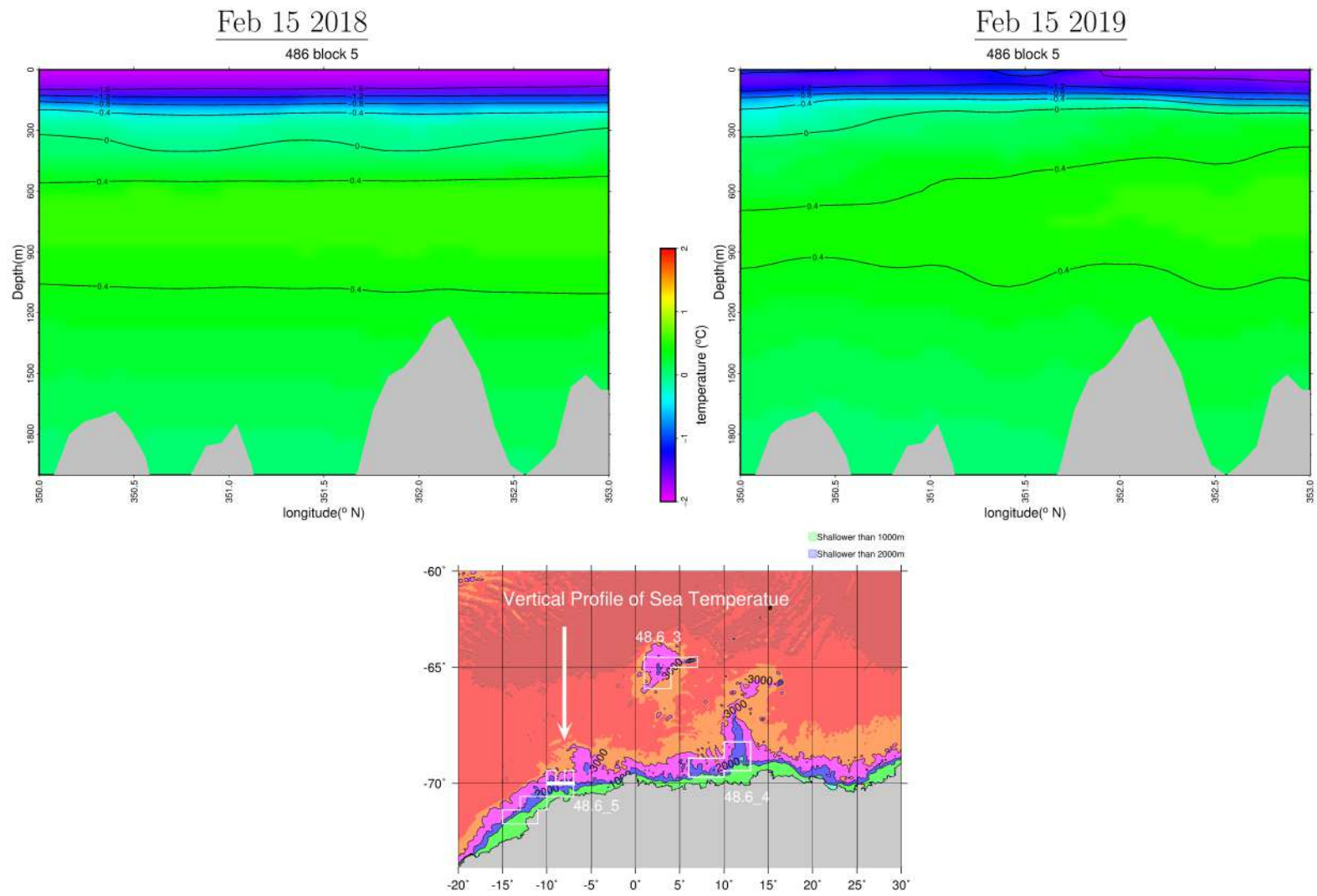


Figure 3 Vertical profile of sea temperature (PST) of Feb.15th along the line between 10W 70S and 7W 70S in 2018 and 2019.

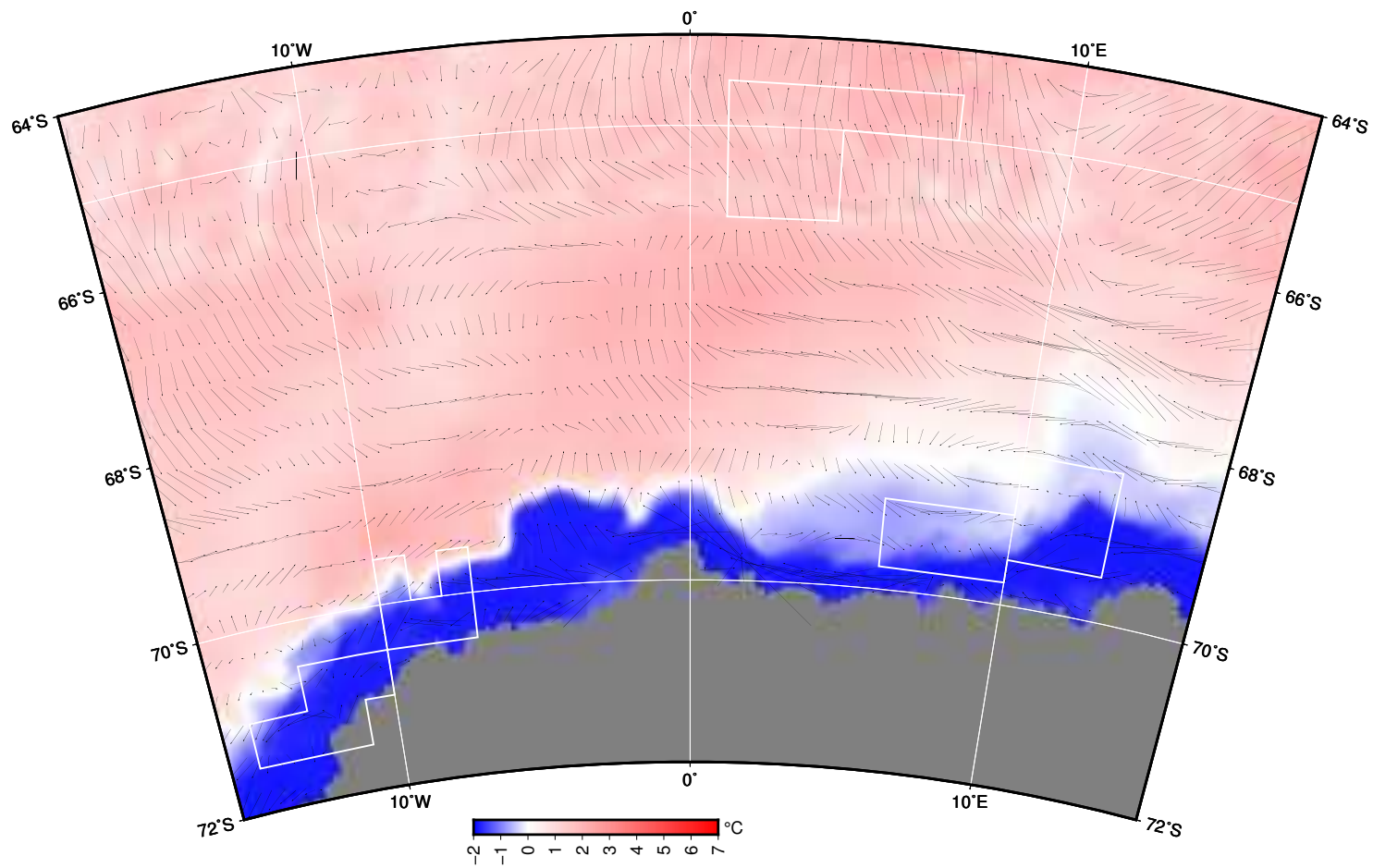
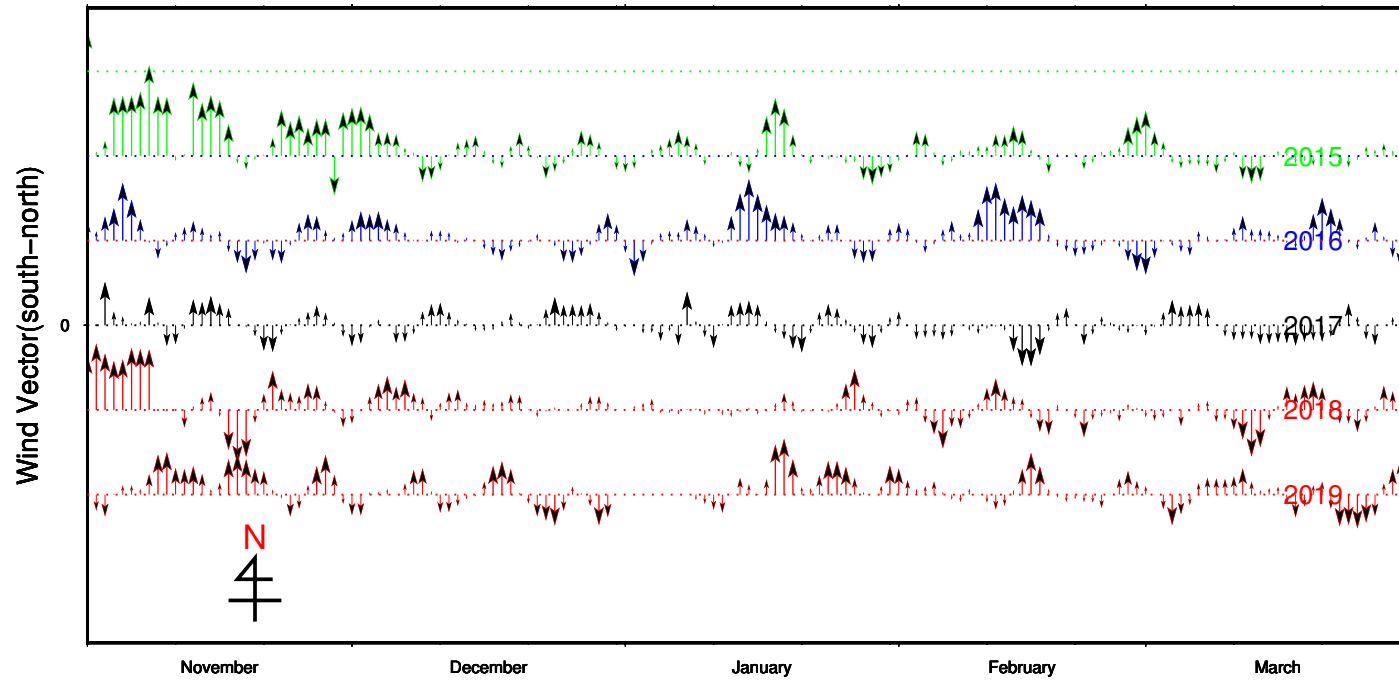


Figure 4 Current vector of southern part of the Subarea of 48.6 of Feb. 15th 2019 with SST by HYCOM.



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Figure 5 Plots of the south-north component of wind over the research block 5 of 2015-2019.