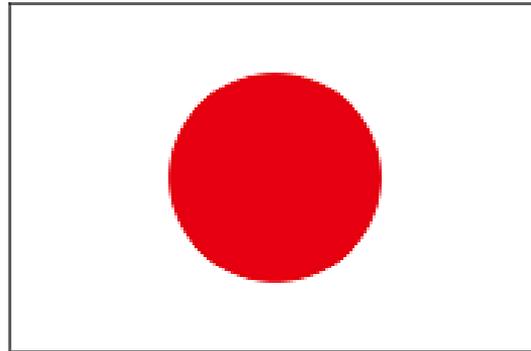


Brief update of recent activities and results for DBO:

Japan DBO results



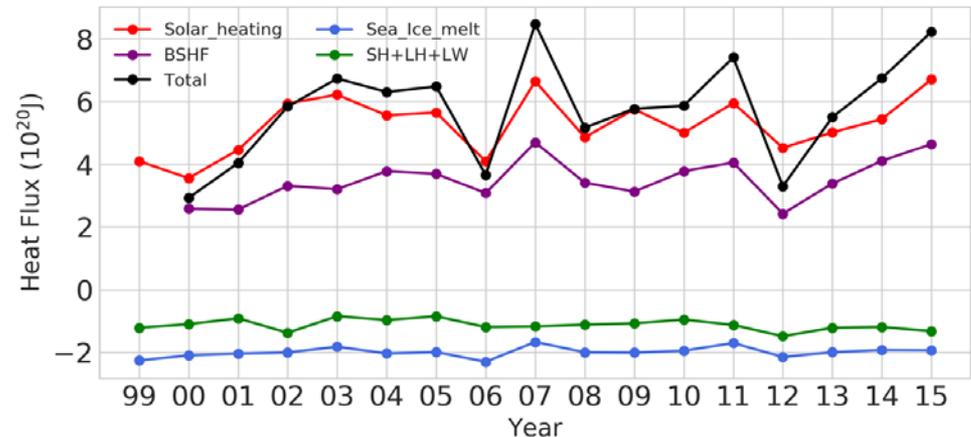
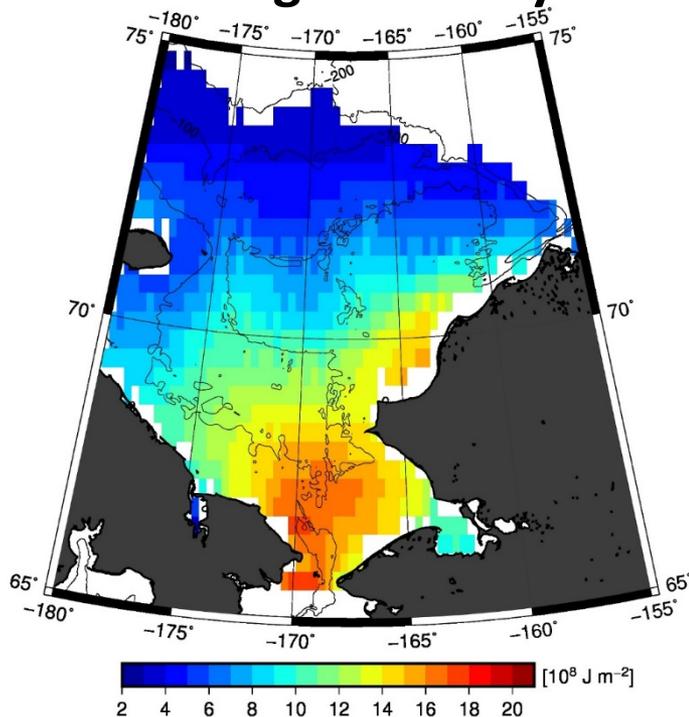
Shigeto Nishino

Interannual variation in solar heating in the Chukchi Sea

Tsukada *et al.* [2018; Polar Science]

- ✓ Interannual variation in solar heating was examined by **satellite** derived sea ice concentration and **reanalysis** shortwave radiation.
- ✓ Short wave radiation was validated by in-situ data by the **R/V Mirai**. NCEP-CFSR/CFSv2 reproduce most accurate values.
- ✓ **Solar heating** during summer in the Chukchi Sea varied from 3.6 to 6.7 $\times 10^{20}$ J and **up to twice** the northward heat flux through the Bering Strait.

Solar heating from May to Sep

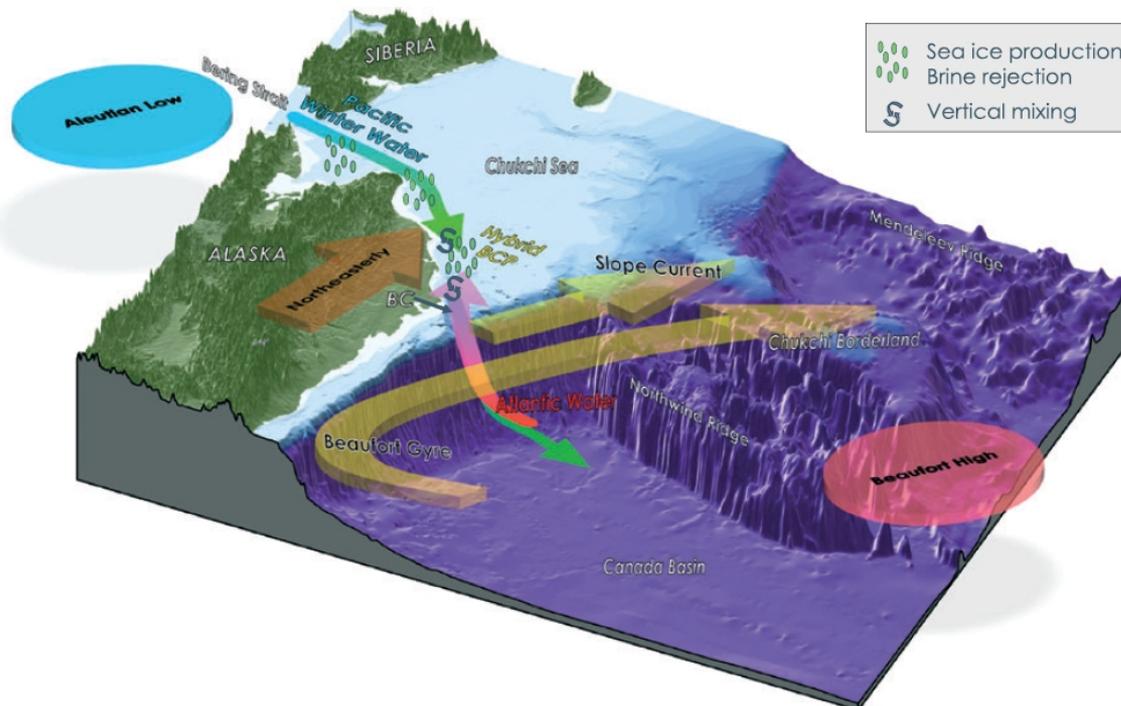


- Solar heating
- Bering Strait heat flux
- Total heating

Winter water formation in coastal polynyas of the eastern Chukchi shelf

Hirano *et al.* [2018; JGR]

- ✓ Water properties and formation processes of Alaskan Coastal Winter Water (**ACWW**) over the eastern Chukchi shelf were examined using data from moorings, atmospheric reanalysis, satellite-derived sea-ice production, and a numerical tracer experiment.
- ✓ The **northeasterly winds**, correlated with the north-south atmospheric pressure gradient between Beaufort High and Aleutian Low, are triggers of **polynya sea-ice production episodes** and **Atlantic water upwelling** in the Barrow Coastal Polynya.

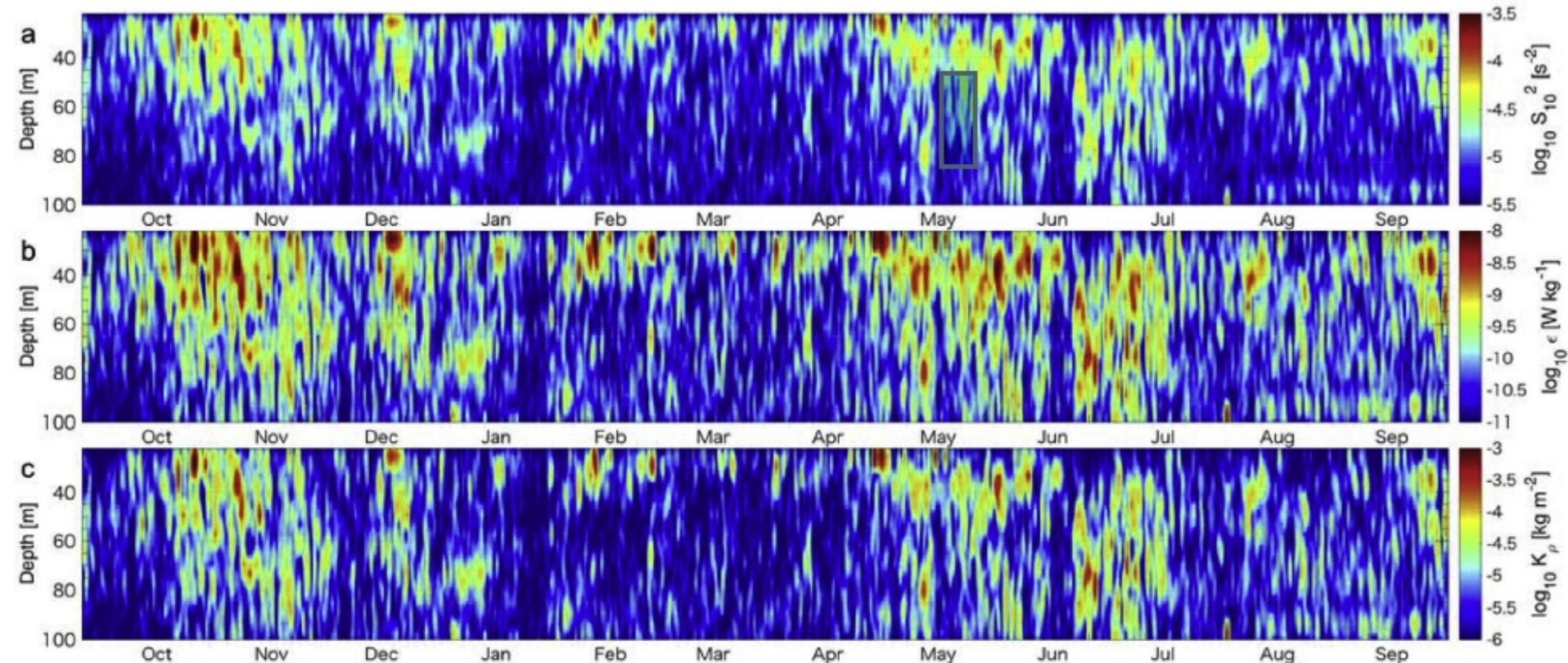


ACWW is transported northwestward with the Chukchi slope current and/or Beaufort Gyre, and contributes to maintenance of the **lower halocline layer** over the Chukchi Borderland.

Ice drift is a driver of the upper ocean mixing in marginal ice zones

Kawaguchi *et al.* [2019; Polar Science]

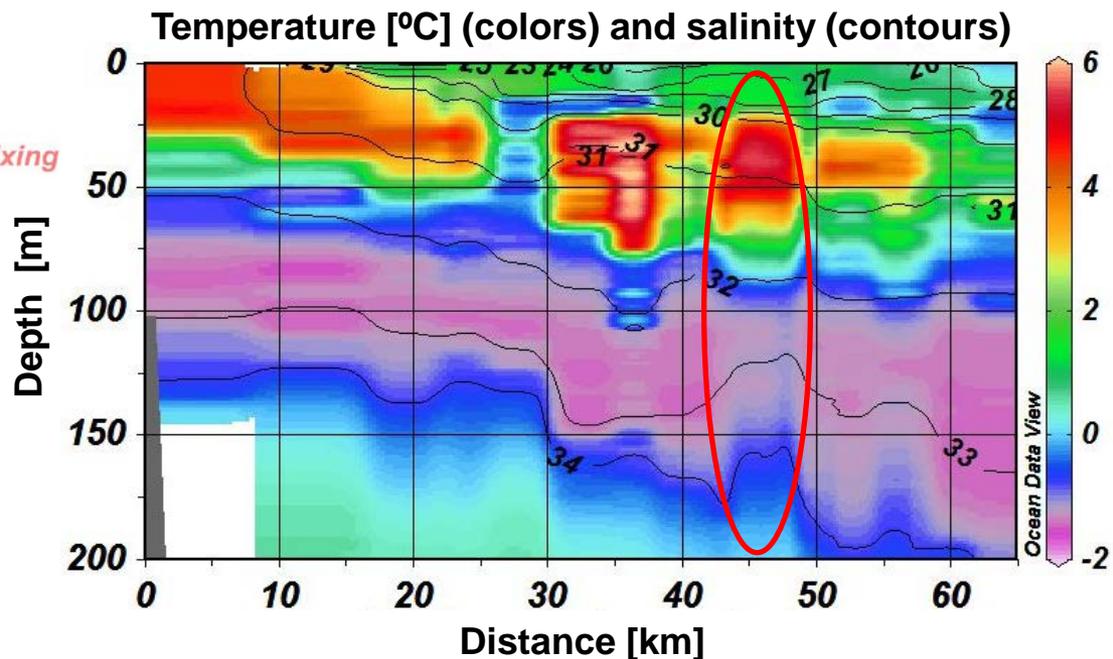
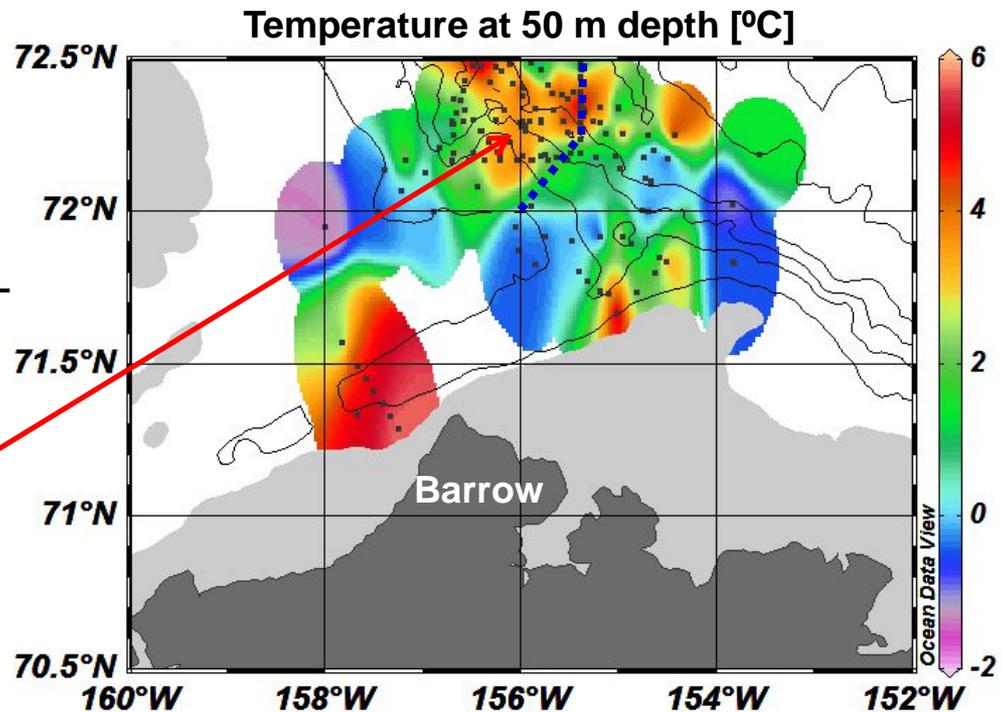
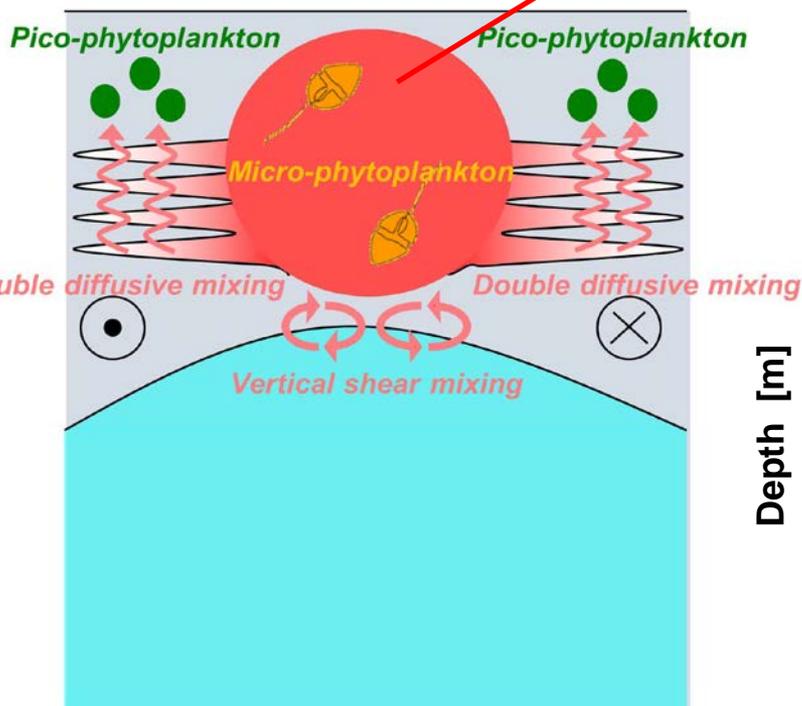
- ✓ Intra-annual variation of near-inertial internal wave (NIW) was examined using a year-round mooring (IPS&ADCP) in the Northwind Abyssal Plain.
- ✓ The turbulent variables associated with NIW are high in **early-summer** and **late-autumn**, and low in the mid-winter.
- ✓ The mixed-layer inertial current driven by **ice drift** is the primary driver of the enhanced NIW generation.



Cyclonic warm-core eddy and its impact on the Arctic marine ecosystem

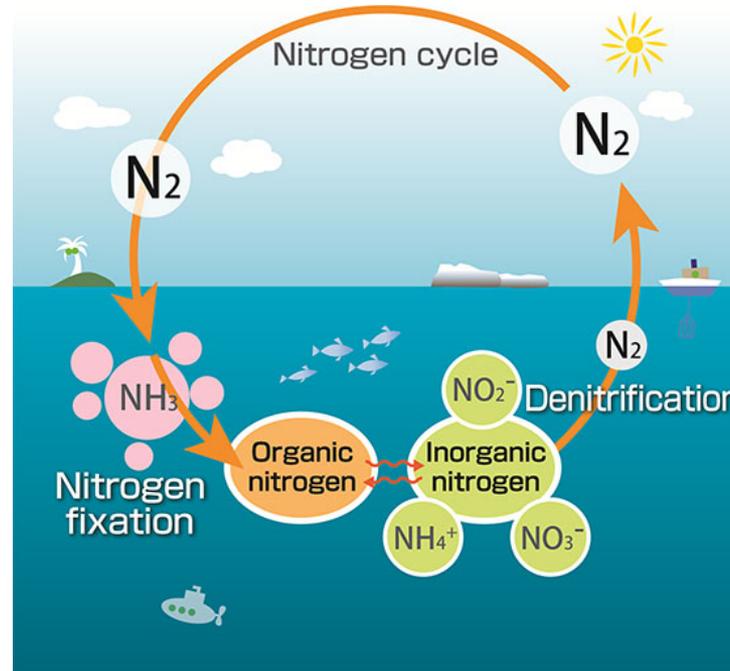
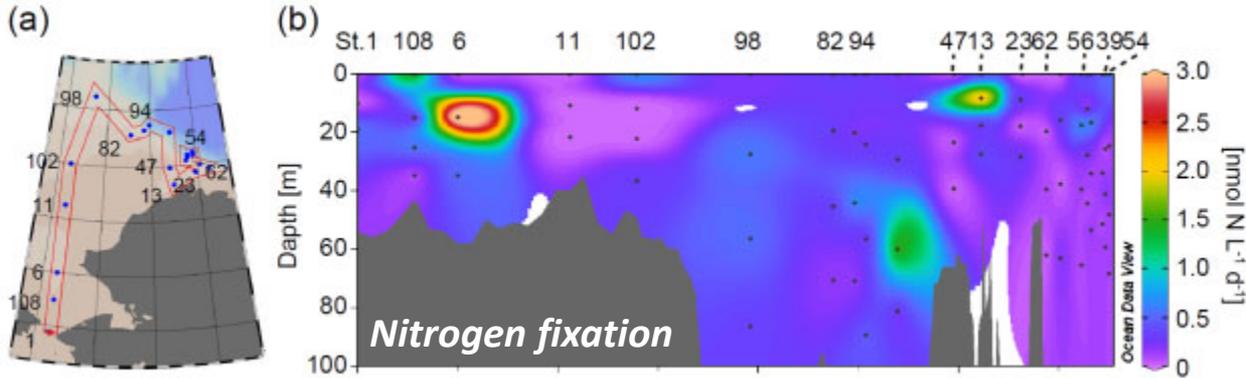
Nishino *et al.* [2018; GRL]

Cyclonic warm-core eddy



Extensive nitrogen fixation occurs in the Chukchi Sea without a clear correlation to depth (light intensity) or nitrate concentration

Shiozaki *et al.* [2018, *Limnol. Oceanogr.*] (Press released)



Tropical/subtropical oceans:

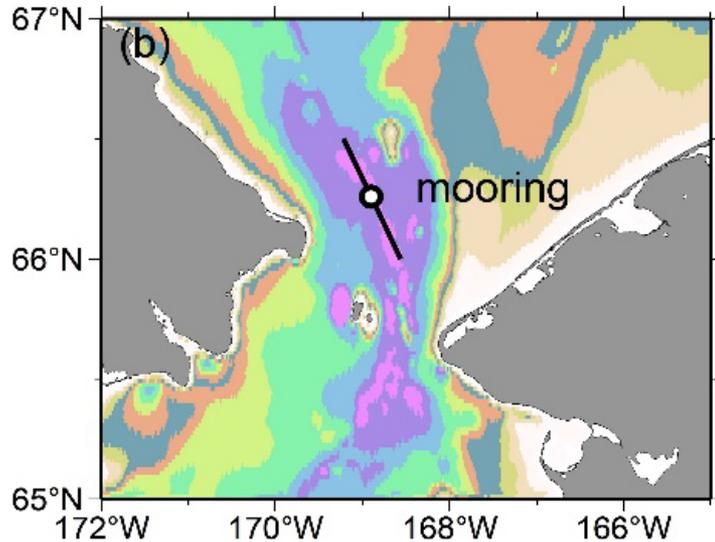
- Oligotrophic water
- N fix is high in the surface
- Diazotrophs: Photosynthetic cyanobacteria

Chukchi Sea:

- Non-oligotrophic water
- N fix is widely detected
- Diazotrophs: Non-photosynthetic anaerobic bacteria

Supplying mechanism of POM to biological hotspots

Abe *et al.* [2019, *Frontiers Mar. Sci.*]



The locally strong barotropic current in the Bering Strait, driving the upward transport of sediment and the subsequent horizontal transport, may play a vital role in supplying particulate organic matter, phytoplankton, or nutrients to the downstream region of the southern Chukchi Sea where the formation of biological hotspots is reported.

