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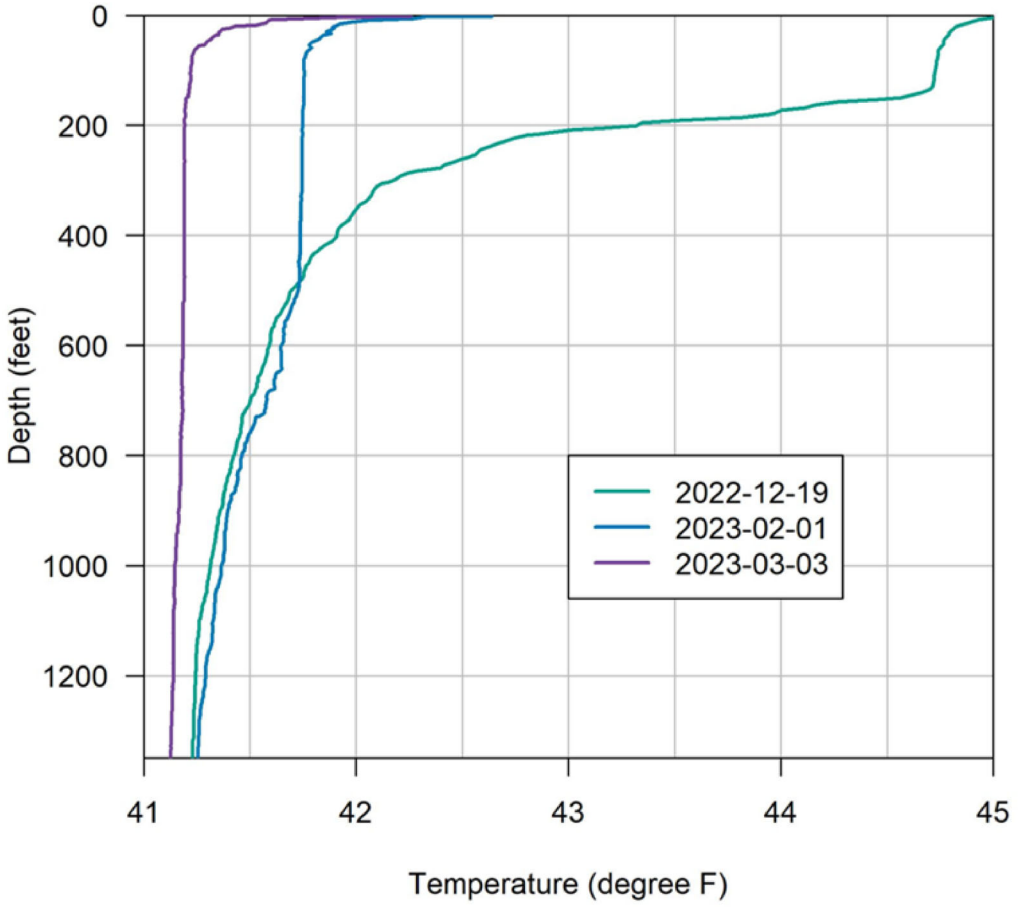
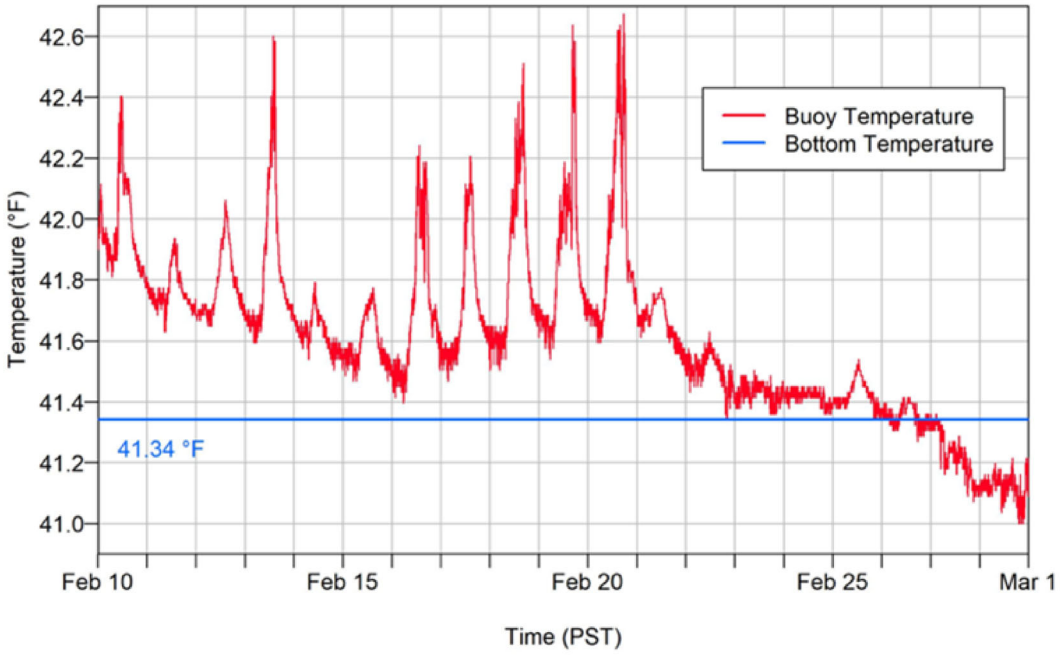
On February 27 or 28, Lake Tahoe flipped or, more correctly, it fully mixed vertically from top to bottom. Full mixing is an annual event in shallower lakes, however for Tahoe and its 1,640-foot depth, it is a less common occurrence. Lake Tahoe last mixed during the 2018-19 winter.

How do we know it flipped? TERC researchers are on the lake every week sampling the water quality, the phytoplankton, and the overall health. Researchers also maintain instruments in the lake, which take measurements every few minutes.

Typically mixing starts in the fall, with the surface layer of the lake cooling and gradually mixing deeper. Most years, the mixing does not extend beyond 1,000 feet. The figure below shows the change in temperature with depth on days in December, February, and March. Note how the cooling of the lake surface progresses, and how the cool water extends down deeper and deeper. On February 1, the lake had only mixed to 500 feet. In less than 4 weeks, it had mixed a further 1,100 feet. On March 3, the entire lake was essentially the same temperature from top to bottom.



Another figure below shows the temperature since February 10 at the lake surface (buoy) and at the bottom of the lake (41.34 ^{O}F measured on February 1). The daily spikes in the buoy data are due to sunlight warming the surface of the lake during the day. On February 28, the two temperatures were equal, and the entire lake started freely mixing top to bottom. In March, researchers will retrieve an instrument deployed at the lake bottom near Glenbrook and will have a minute-by-minute description of events at the bottom during mixing.



What causes the mixing? Surprisingly the air temperature is the largest factor, not the intensity of individual storms. This has been a particularly cold winter, causing the lake to mix deeper and weeks earlier compared to most other years.

Is deep mixing good or bad? It is extremely good for the lake as it is renews the water at the lake bottom with “fresh” oxygen-rich water from the surface. Oxygen is constantly being lost from the lake bottom, so it requires replenishment. Mixing also helps cool the bottom of the lake, which slowly warms due to geothermal heating.

Are there any other impacts? The deepest waters of the lake are also the clearest waters, so when they are mixed with the overlying water there is a short period of high clarity. This year, two days after mixing, the Secchi depth was an astounding 115 feet, almost 33 feet deeper than it had been a week earlier.

The mixing also redistributes nutrients. Algae and organic material in the lake eventually ends up at the bottom, and through decomposition nutrients are released. These nutrients can build up over many years, so when deep mixing takes place, the bottom nutrients are carried all throughout the lake. In some years this is the largest source of nutrients to the lake surface and can lead to increased algal growth as well as a decline in lake clarity. In the coming months, we expect clarity to decrease as algae grow and fine particles begin entering the lake with the snowmelt.

A big shout out to the TERC field team who are out in all seasons collecting measurements and deploying instruments in all kinds of weather, and to our data impresario Dr. Shohei Watanabe who waits eagerly for each piece of new data. The temperature data collection was in part funded by the Tahoe Regional Planning Agency. The temperature buoys are operated in collaboration with the NASA Jet Propulsion Laboratory.

One of four temperature buoys currently on Lake Tahoe

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