

Finding melt in ice cores using noble gases

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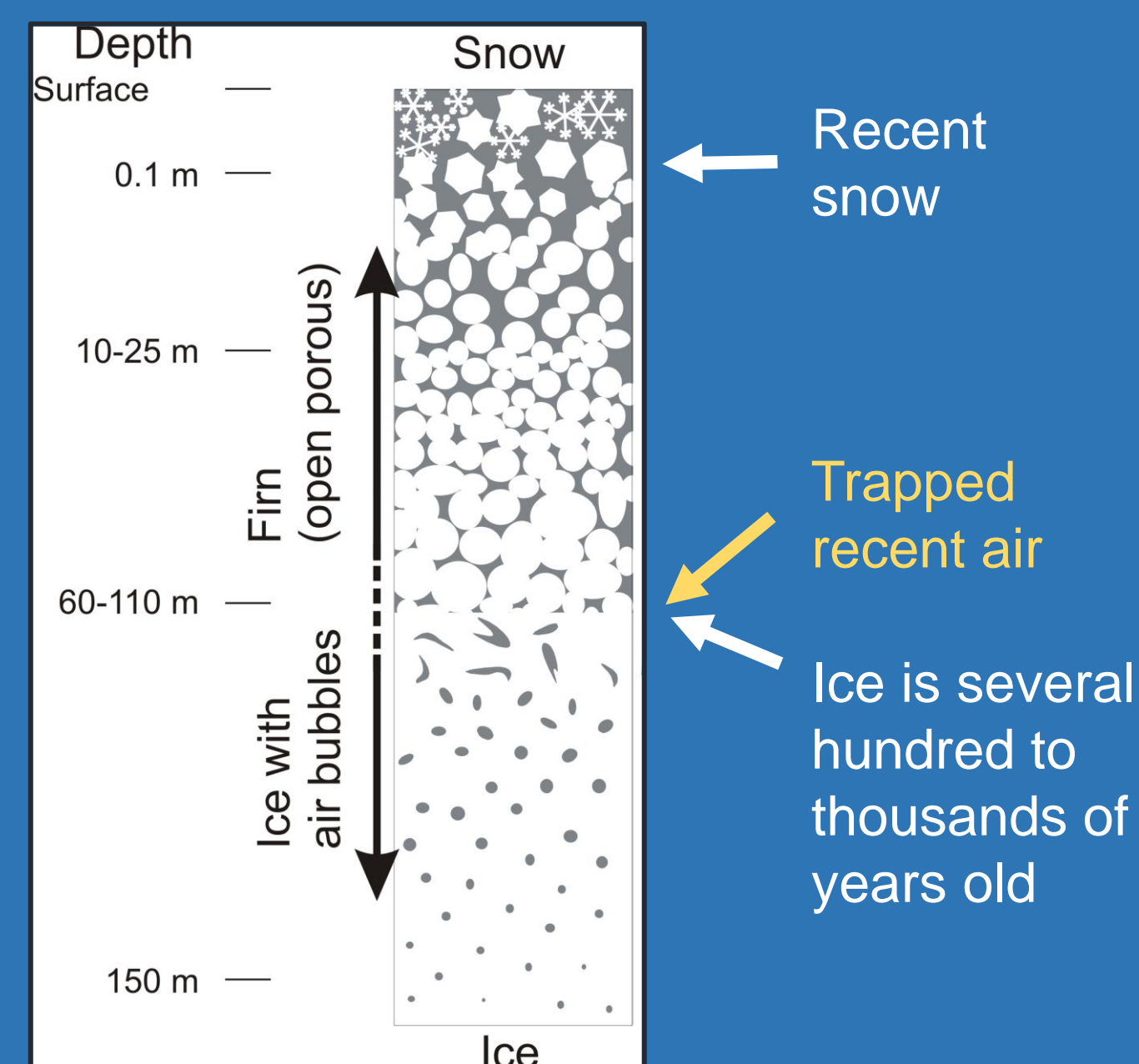
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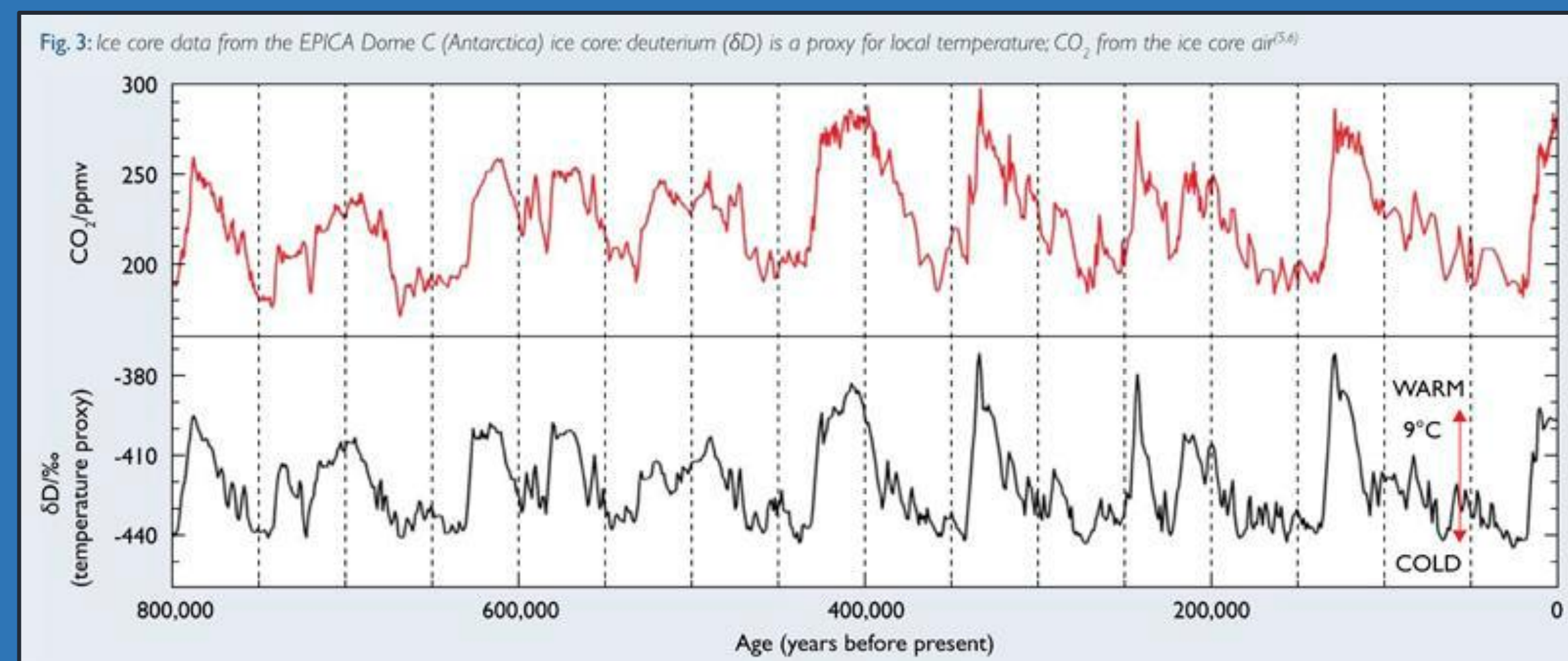
Ice cores provide key archives of climate

Every year, snow falls on top of ice sheets and glaciers. Any snow that lasts more than one year becomes firn, the stage between snow and ice. Eventually the pressure of overlying snow compresses firn into ice.

The air trapped between the snowflakes eventually becomes bubbles in the ice. These bubbles contain ancient atmospheric air.



Source: Forbes

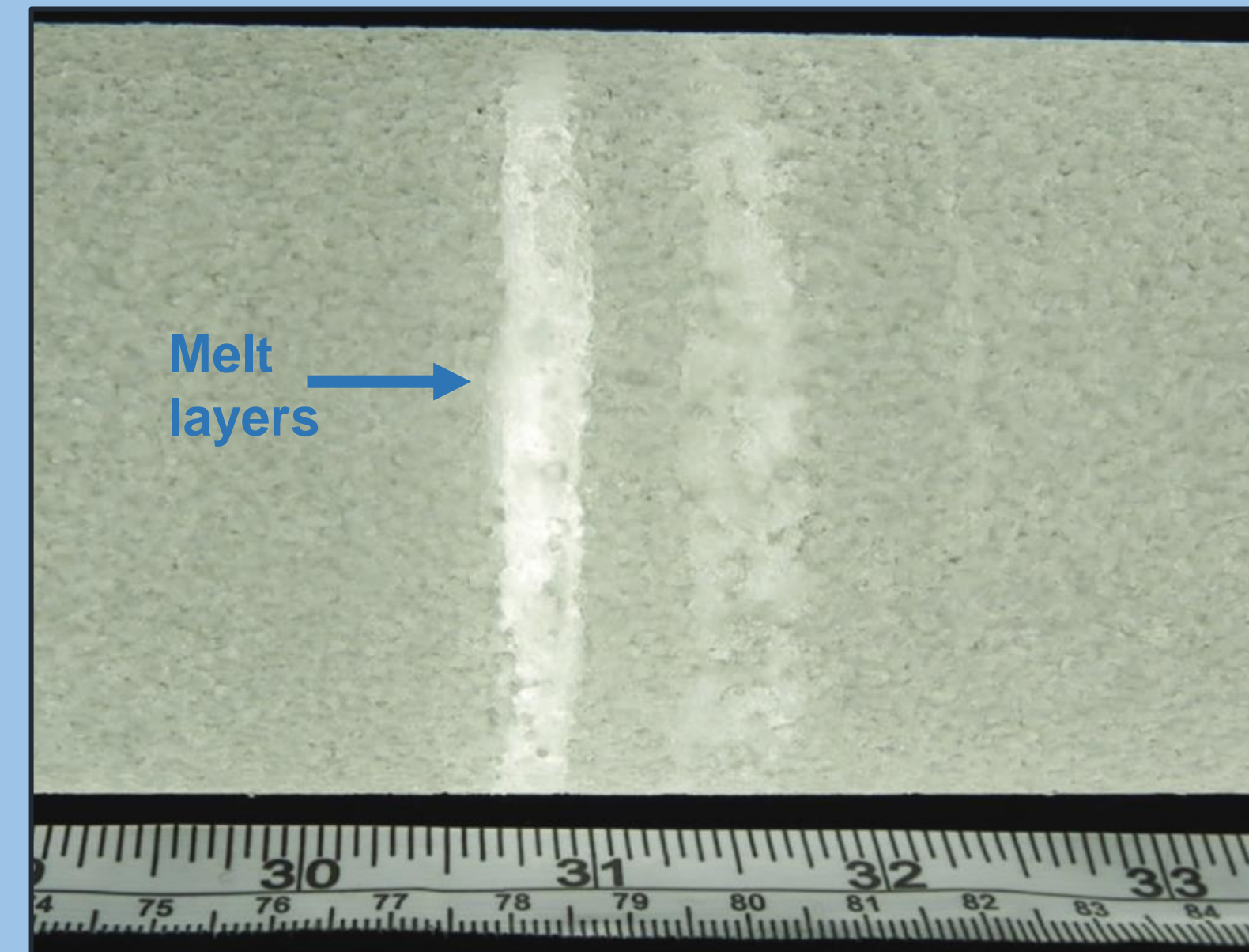


Continuous ice core records extend back 800,000 years. Through several ice age cycles, CO₂ stays between 180 and 280 ppm. Today, CO₂ is at 420 ppm.



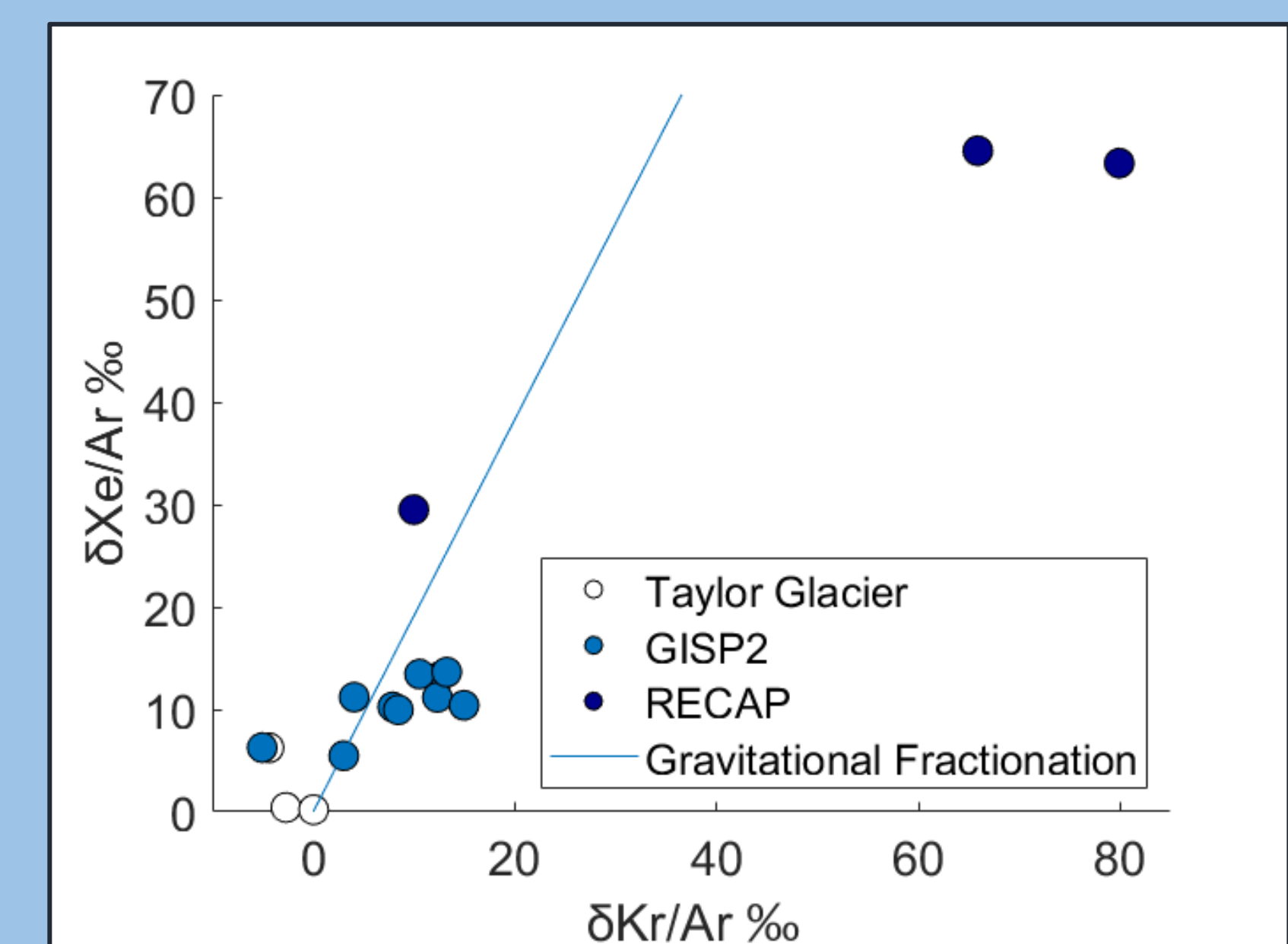
Noble gas ratios show melt layers in ice cores

Source: Orsi et al. 2015



Surface melt on ice sheets occurs during summer, meaning that melt frequency and intensity can tell us about summer temperatures—specifically, the number of days above freezing (“positive-degree days”). Melt layers in ice cores are typically identified visually, but this method can be prone to errors. The heavy noble gases xenon (Xe) and krypton (Kr) are more soluble in water than lighter gases argon (Ar) and nitrogen (N₂), causing them to become enriched in melt layers.

Using the isotopic and elemental ratios of these heavier to lighter gases, this project aims to generate melt records of key warm periods in four Arctic ice cores. While this method has been used previously to identify melt events in the Eemian section of the NEEM ice core, this will be the first systematic application of the noble gas ratio method to obtain data on past melting.



Preliminary data from this project



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