How Vikings navigated the Northern seas

They explored open ocean using crystals that revealed distinct patterns of light in the sky, say scientists

When the Vikings left the familiar fjords of Norway for icy, uncharted territories, they were at the mercy of weather. They had no magnetic compasses, and no way to ward off stretches of heavy clouds or fog that made it difficult to navigate by sun. How the explorers traversed open ocean during these times is a mystery that has long captivated scholars.

Norse sagas refer to a sólarstein or “sunstone” that had special properties when held to the sky. In 1967, a Danish archaeologist named Thorkild Ramskou suggested these were crystals that revealed distinct patterns of light in the sky, caused by polarization, which exist even in overcast weather or when the sun dips below the horizon. Multiple translucent crystals fit the bill, namely calcite, cordierite and tourmaline. None have ever been found at Viking archaeological sites, but a calcite crystal was discovered in the wreck of a British warship from the 1500s, indicating it might have been a tool known to advanced ocean navigators.

A study published on Wednesday in Royal Society Open Science advances this idea, suggesting the Vikings had a high chance of reaching a destination like Greenland in cloudy or foggy weather if they used sunstones and checked them at least every three hours.

Their latest work uses a computer model that simulated 3,600 three-week trips from Norway to Greenland under varying cloud cover at two dates, spring equinox and summer solstice, which are marked on the Uunartoq disc.

If the Vikings oriented their ship with calcite, cordierite or tourmaline at least every three hours, the model showed, they had a 92 to 100% chance of getting within sight of Greenland. These are “surprisingly large success rates” for navigating in overcast conditions, the authors noted.

The key to sunstone navigation is polarization, a process that filters light rays so they can only move in one plane.