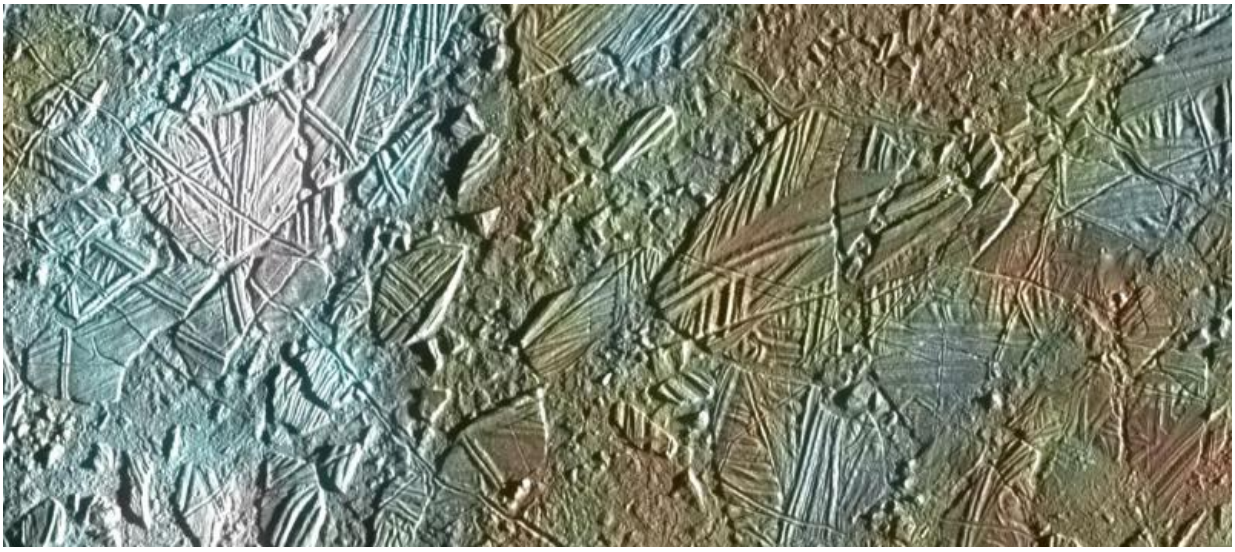
Image: Chaos on watery Europa

May 11 2015



Credit: NASA/JPL/University of Arizona

Jupiter's moon Europa is brimming with water. Although it is thought to be mostly made up of rocky material, the moon is wrapped in a thick layer of water – some frozen to form an icy crust, some potentially pooled in shallow underground lakes or layers of slush, and vast quantities more lurking even deeper still in the form of a giant subsurface ocean.

This false-colour image from NASA's Galileo spacecraft shows a disrupted part of Europa's crust known as Conamara Chaos. The long criss-crossing grooves etched into the shattered chunks of ice are a

perfect example of "chaos terrain" – a feature seen most prominently in our Solar System on Europa, Mars and Mercury.

Although the exact ways chaos regions form are not completely understood, in the case of Europa scientists have a few ideas. One possibility is fast-moving impactors that smash through the moon's brittle crust. As a liquid layer lies immediately beneath the crust, the shards are more mobile and can refreeze in different configurations, creating a fractured terrain with young scars carved into the icy plains.

Many chaos regions have small impact craters clustered nearby. In the case of Conamara Chaos, for example, a large 26 km-diameter crater named Pwyll lies 1000 km to the south, and a handful of smaller, 500 m-diameter craters are scattered throughout the region, likely formed by lumps of ice thrown up by the impact that created Pwyll.

Another suggestion is that Europa harbours an intricate system of shallow subsurface lakes. Instead of an object slamming into the Jovian moon, a lake system could influence and stress the crust from below to cause the thin ice sheets to fracture and collapse.

This patch of Europa's crust takes on an iridescent appearance in this false-colour image, which strongly enhances subtle colour differences present in the scene. Areas of blue and white stand out distinctly from areas of rusty orange and bronze. This colouration is thought to be caused by material from Pwyll: when the crater formed it threw up a blanket of fine ice particles that settled over parts of Conamara Chaos, colouring parts of the landscape in dark blue (coarser particles of ice), light blue (smaller particles) and white (very fine particles). The bronze patches are regions of ice that have been stained by minerals from beneath the disrupted crust.

Although astronomers have studied Europa intensively, the only way to

confirm the structure and composition of the moon is to probe its shell and interior with a space probe. ESA's JUpiter ICy moons Explorer (Juice) mission aims to do just that when it arrives in the Jovian system in 2030. Alongside detailed studies of Jupiter itself, Juice will explore and characterise three of the gas giant's potentially habitable icy moons: Ganymede, Europa and Callisto. The mission is in development, on track for launch in 2022.

North is to the top of the picture and the Sun illuminates the surface from the right side of the frame. The image is centred at 9ºN / 274ºW, and covers an area of some 70 km by 30 km. The image combines data taken by Galileo's Solid State Imaging system during three orbits through the Jovian system in 1996 and 1997.

Provided by European Space Agency