Liquid water near Europa's surface a rarity

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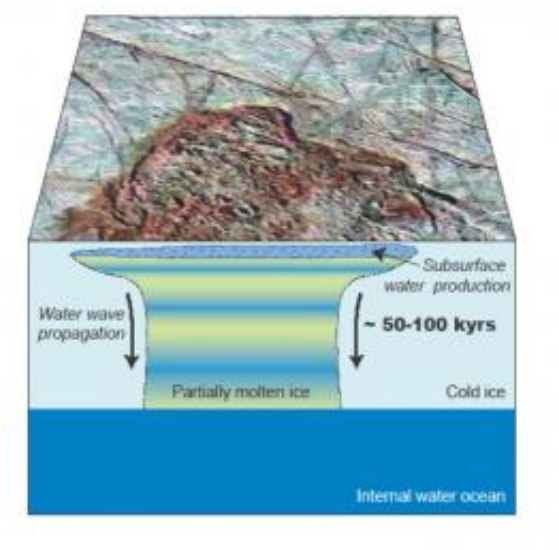


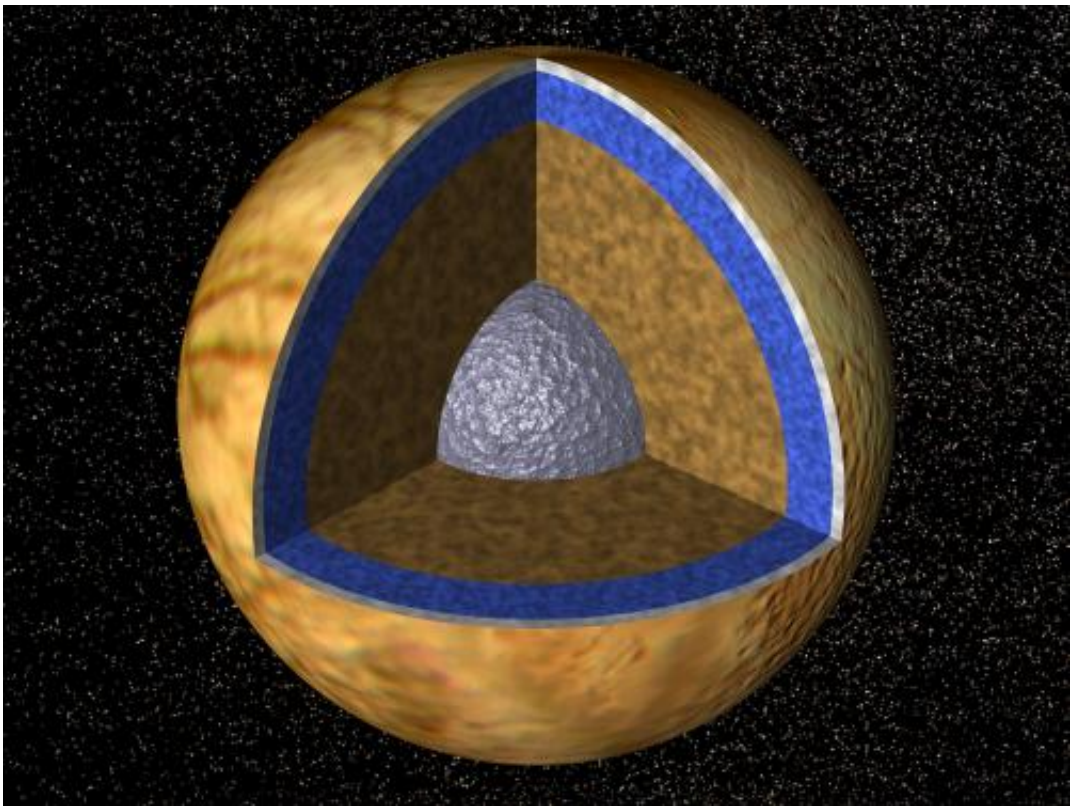
Water near Europa's surface migrates downwards toward an ocean. Credit: K. Kalousová.

(Phys.org)—Europa, the enigmatic moon of Jupiter, is believed to be home to a subsurface ocean of liquid water. However, future missions to explore Europa's ocean may need to dig deep. Research suggests that water does not stay in a liquid state near Europa's surface for longer than a few tens of thousands of years—the blink of an eye in geological terms. Klára Kalousová will present this work at the European Planetary Science Congress in Madrid on Tuesday 25 September 2012.

Europa is mainly made from rock and iron, with a water shell around 100 km deep beneath a crust of solid ice. The ocean is warmed

sufficiently to maintain its liquid state by heat produced as a by-product of gravitational pulling to-and-fro from Jupiter.

Pockets of liquid water could be tantalizingly close to the surface. However, Kalousová, from the University of Nantes and Charles University in Prague, believes these would be short-lived. She explains, "A global water ocean may be present, but relatively deep below the surface—around 25 to 50 km. There could be areas of liquid water at much shallower depths, say around 5 km, but these would only exist for a few tens of thousands of years before migrating downwards."



This artist's cutaway view shows our current understanding of Europa's interior. Credit: NASA/JPL.

Kalousová reached these conclusions by mathematically modeling mixtures of liquid water and solid ice under different conditions. She found that due to factors such as density and viscosity differences, liquid water migrates rapidly downwards through partially molten ice and eventually reaches the subsurface ocean.

Other locations in our solar system may be analyzed using this work. Kalousová explains, "As well as helping us to better understand Europa's water cycle, this research could provide insight into icy moons that are geologically active, such as Enceladus, and worlds that have cycles connecting the interior with a surface atmosphere, such as Titan."

Provided by European Planetary Science Congress