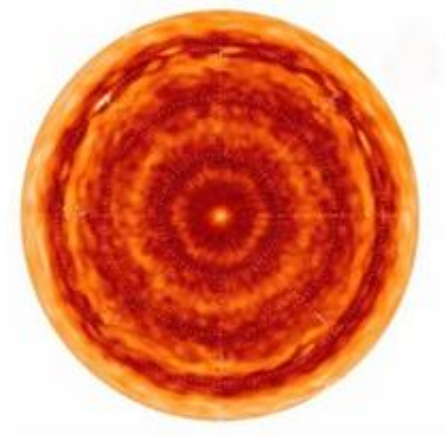
Fluid clue to Saturn's hexagon (w/ Video)

April 16 2010, by Pete Wilton



(PhysOrg.com) -- An unusual hexagonal structure found in Saturn's atmosphere has been recreated in an Oxford laboratory.

The mysterious 'hexagon' occurs at the planet's chilly North Pole and, as we reported in 2008, has been shown to extend deep into Saturn's atmosphere with a 'hotspot' at its core.

In new work published in Icarus, Peter Read and Ana Aguiar of Oxford University's Department of Physics have investigated the ways in which such an unusual polygonal structure may have formed.

They did this with experiments using a water tank filled with a solution of water and glycerol peppered with white 'tracer' particles. This tank

was then mounted on a turntable and lit in such a way that the solution's flow at various speeds could be captured on camera.

'The video above shows the development of a flow produced when a disk or ring mounted in the base or lid of the tank is set into rotation relative to the rest of the tank,' Peter Read explains.

'This differential rotation carries the fluid along with it to create a shear flow in which the azimuthal flow varies with radius. It crudely represents the shear found on the flanks of the eastward-moving jet stream on Saturn at around 76 degrees North, with around the same magnitude of shear compared with the background rotation as on Saturn itself.'

He tells me that this flow is unstable and spontaneously develops meanders and vortices that eventually form a six-sided pattern that settles into a hexagonal shape - something made clear by the pattern of tracer particles.

'The formation of such a steady, symmetrical pattern, slowly drifting around a tank, seems to be directly analogous to what appears to be happening on Saturn itself on a scale of thousands of kilometres,' Peter adds.

The experiments demonstrate that at least one possible end-product of such an instability is the production of a steady, polygonal shape that calculations suggest could also occur on Saturn.

'While this does not prove that Saturn's hexagon definitely occurs via the same processes as in our experiments, it does demonstrate that it could do so, and suggests other things for scientists to look for that may help to improve our understanding of Saturn's atmosphere.'

Provided by Oxford University