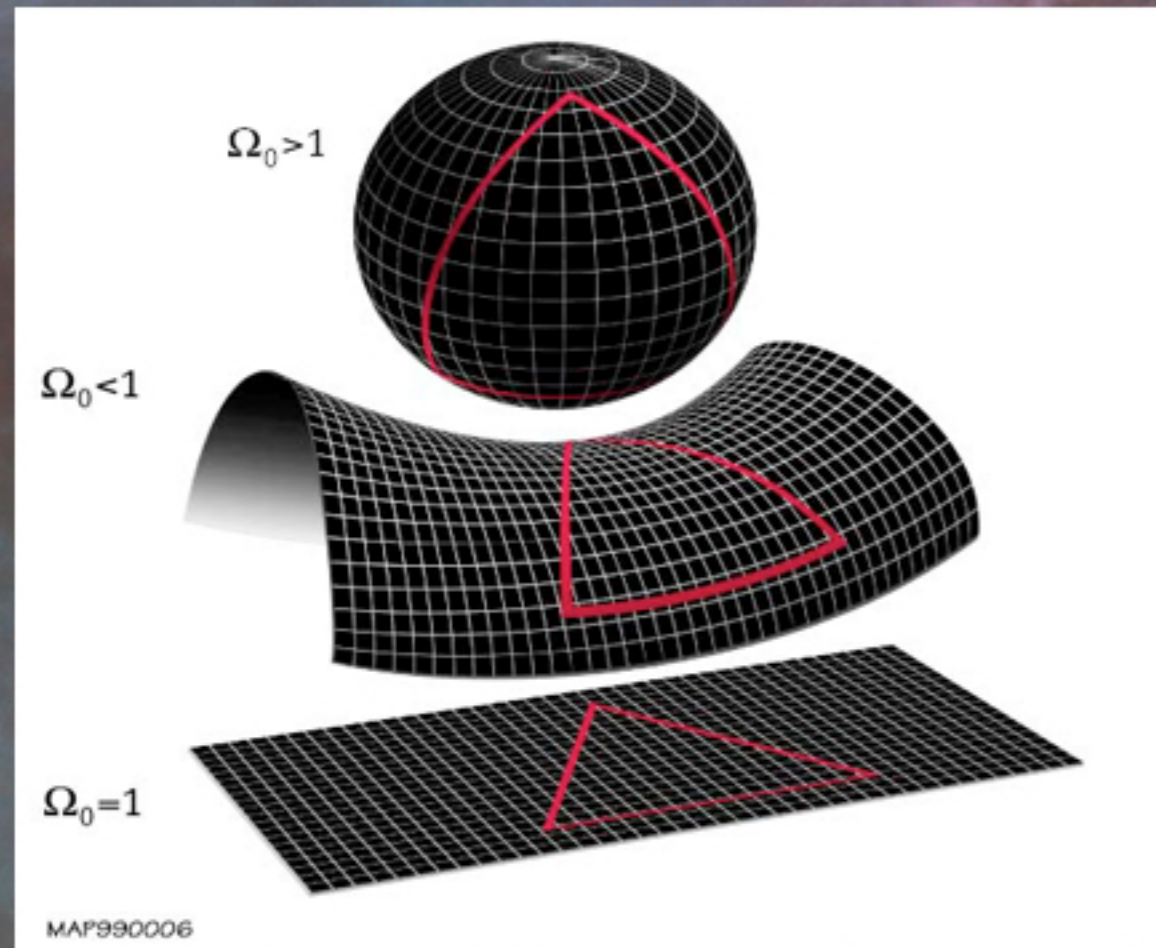


COSMIC

TOPOLOGY

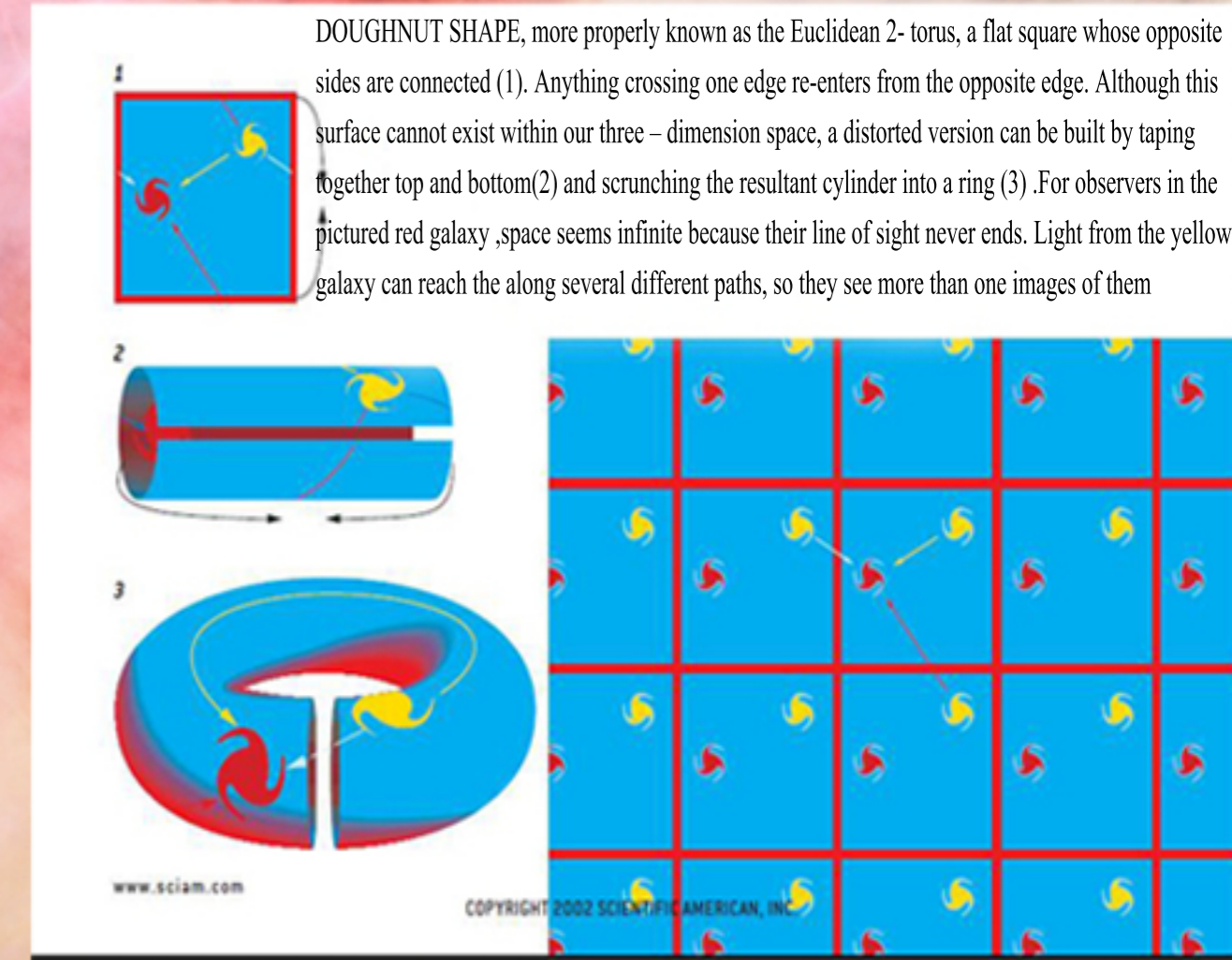


CONVENTIONAL WISDOM SAYS THAT THE UNIVERSE IS INFINITE. BUT IT COULD BE FINITE, MERELY GIVING THE ILLUSION OF INFINITY.



WHY TOPOLOGY?

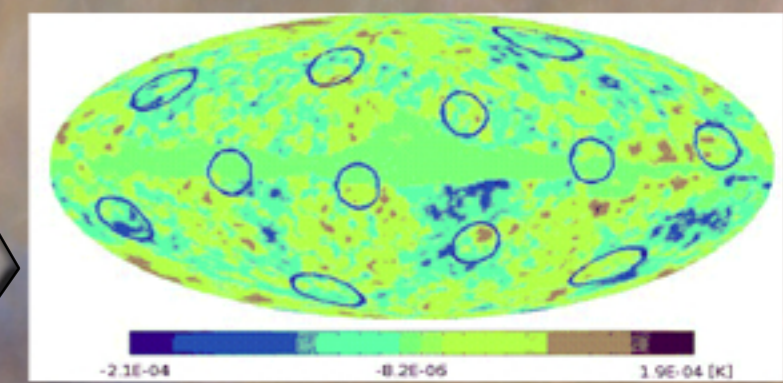
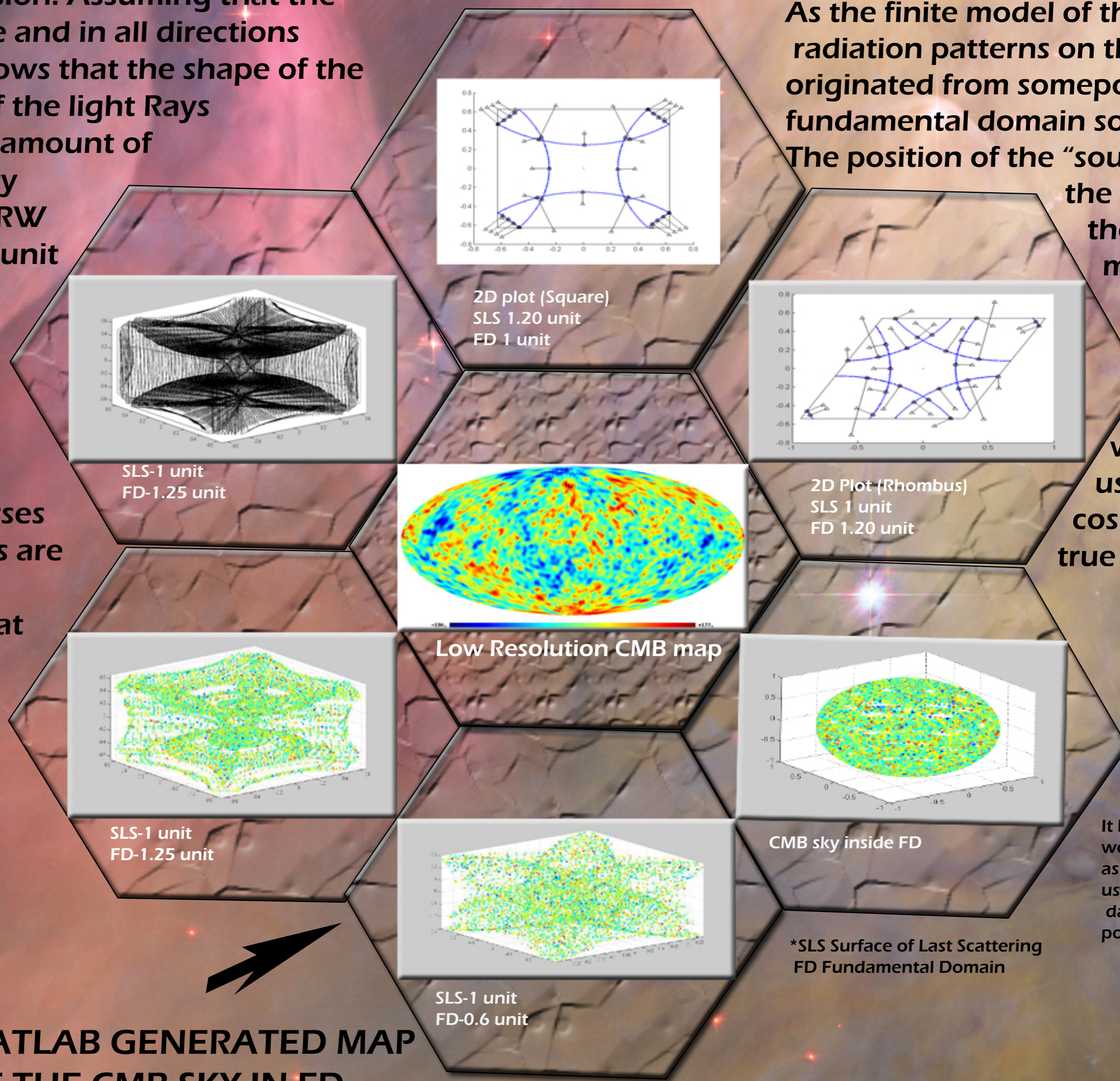
General Relativity can't tell us whether the universe is infinite or whether it is globally connected, finite and edgeless. Topology describes global features of the physical space which are unaltered by smooth and continuous deformations. Cosmic Topology aims to deduce the global shape of the universe by observing a pattern in the distribution of astronomical objects. Cosmic Microwave Background, which is the relic of our deep past, can be used to decipher the global topology.



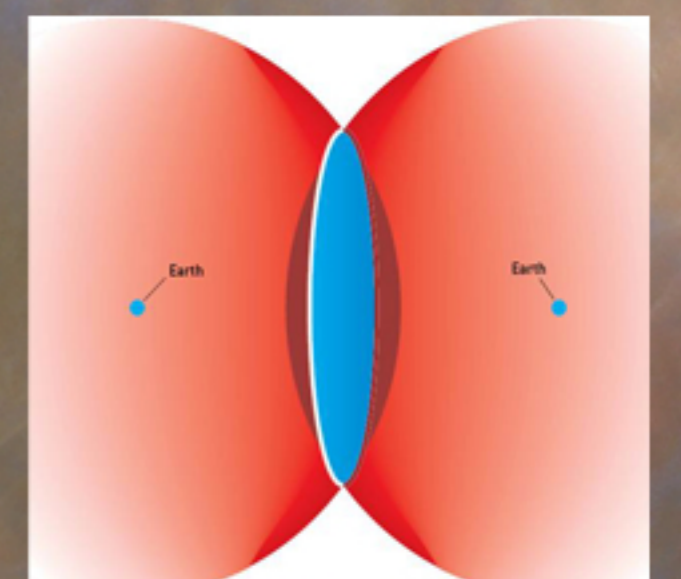
The Shape of The Universe

General Relativity (GR) imagines a universe of 3 space dimensions plus one time dimension. Assuming that the Universe is the same everywhere and in all directions (as Observations indicate), GR shows that the shape of the space-time, meaning the paths of the light Rays (null geodesics), depends on the amount of mass-energy within it. The density parameter Ω as found from the FRW theory refers to mass-energy per unit volume, averaged over all Space. $\Omega=1$ would make the Universe "flat" like Euclidean geometry. Lower values yield "hyperbolic" ("Saddle shaped") space-times, while larger Ω corresponds to "spherical" spacetimes. All universes Are boundless; the first two kinds are also infinite in size. Until recently astronomers began to Believe that our universe is finite....

As the finite model of the universe suggests the radiation patterns on the CMB sky might have originated from somepoint inside our own fundamental domain somewhere back in time. The position of the "source" would vary with the non-trivial topologies of the domain itself. Our work mainly comprises of formulating algorithms to map the CMB anisotropy onto our fundamental domain which in future could be used to develop a cosmological tool to find the true "Shape of The Universe"

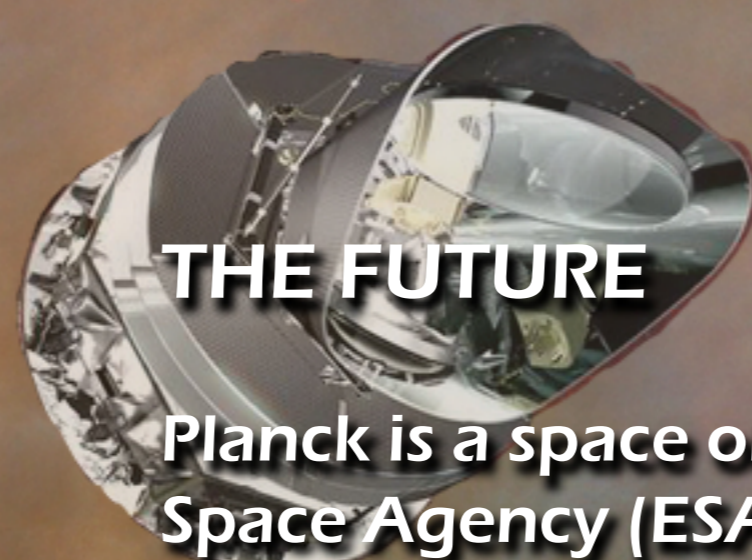


It has been suggested by Roukema and co-workers that the topology of the universe as probed by the "matched circle" method using the 1st year release of the WMAP CMB data matches that of the Poincaré dodecahedron model.



MATLAB GENERATED MAP OF THE CMB SKY IN FD

Looking up at the sky on a clear night, we feel we can see forever. There seems to be no end to the stars and galaxies; even the darkness between them is filled with light. In truth, the volume of the space we can observe is limited by the age of the universe and the speed of the light. With time we may probe further to encounter new galaxies and phenomenon or "May be not". Like a hall of mirrors, the apparently endless universe might be deluding us. The cosmos could, in fact, be FINITE. The illusion of infinity would come about as light wrapped all way around space, perhaps more than once - creating multiple images of each galaxy. Instead of being simply connected and infinite, a finite and multiply connected universe may be the reason of this 'grand illusion'.



THE FUTURE

Planck is a space observatory of the European Space Agency (ESA) and designed to observe the anisotropies of the cosmic microwave background (CMB) over the entire sky, at a high sensitivity and angular resolution. AS soon as the high resolution data from the planck surveyor is available, we expect to generalise such kind of algorithms in order to generate the tools to probe into the different form of topologies that our visible universe might have...

Each copy of the earth will come complete with its own surface of its last scatter i.e. our own visible universe. If the two images of the earth are near enough, these identical copies of the SLS will intersect. The intersection of the two spheres will form a circle. Since the observers at the centre of the intersecting spheres are actually just copies of one observer. The circle of intersection must always come in pairs.