Katrina Bettencourt and Erol Chandler

Notes for 10/27/10

Life in the Universe

Earths Special Case

Earths Moon

The moon is very large. If it were not revolving the earth but rather a star, it would be considered a planet itself. Scientists are not sure if it is necessary for habitable planet or not to have a big moon. The fact that we have one is strange. Most terrestrial planets do not have a big moon and it is scientifically improbable for such a small planet to have one. The moon gives us some advantages. It is gravitationally bound to the earth which prevents out tilt from varying too largely. This gives us an even climate, raises tides and gives us the entire ecosystem of our oceans.

Image: http://originandpurpose.com/Clues.html (article in link is unrelated)

Solar Wind and magnetic fields

Solar winds are streams of charged particles emitted from the outer layer of the sun. It is effective if the wind penetrates below the exo-base and is not blocked by a magnetic field. The atmosphere of planet would get scorned by charged particles and ionized radiation.

Solar winds are the reason Mars' atmosphere was disintegrated. Mars does not have a magnetic field.

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Solar winds also hit Venus and stripped the planet of its hydrogen, which lead to loss of any oceans it may have had.

Earth's magnetic field deflects solar winds. We have an unusually large field due to having a Very conductive core and a High rotation rate

Aurora (Northern lights) -- happens due to a few charged particles interacting with the atmosphere near the poles.

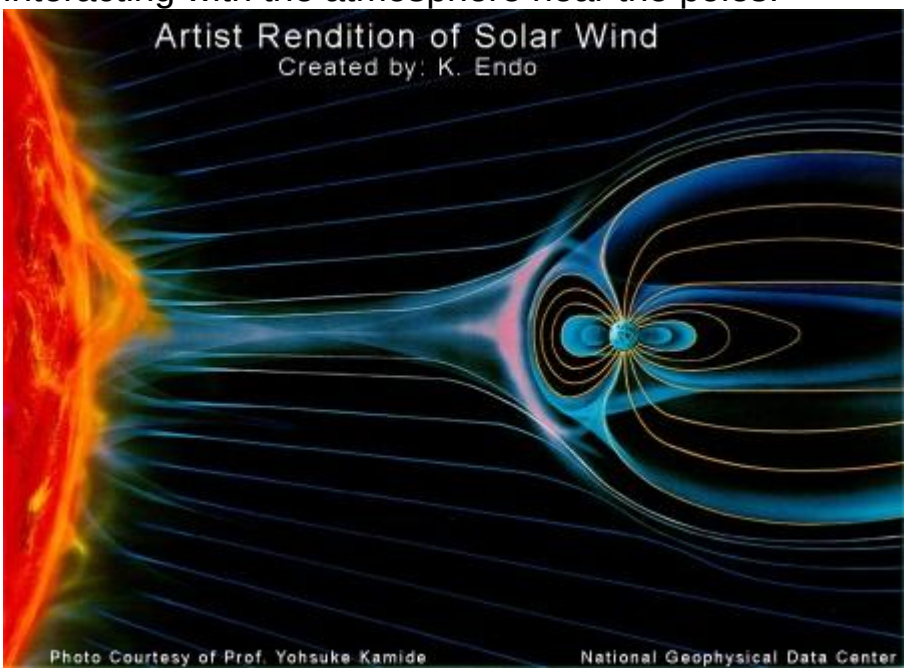

Image: http://netdaw.com/?paged=6

Needed For Life to Begin on a Planet

- Right mass star-Bid enough but also long enough life span.
- Right mass planet @ right distance from sun
- Plate tectonics- We may be the smallest planet to have plate tectonics. Studies show that we need them to have life on a planet along with liquid water.
- Magnetic field- protects us from solar winds and radiation.
- Close to circular orbits of everything w/ significant mass. In our case, Jupiter must have circular orbit and catch debris.

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- *May need* large moon for axial tilt standardizing

Other than this, we really don't know. Most of the time, there is just a race between how long it takes to evolve to an intelligent species and how long before your star dies. Planets are very unlikely to meet all this criteria and have life. We are not standard.

Exo Planet Search

Techniques (what we search for)

There are two ways of looking at a planet. You can look at it edge on or you can look at down on the plain. The perspective is extremely important.

Astrometry: This is a very old technique involving measuring the displacement the proposed planets cause in their parent star's apparent position on the sky, due to their mutual orbit around the center of mass of the system. It measures the wobbles around the center of mass between the planets and sun. One would need to watch for a long time. Looking down on the plain is the best perspective for this method. It is specific to finding planets with small orbits close to its star. However, no planets have been found using this method.

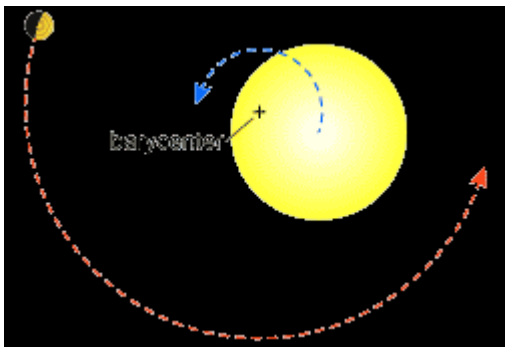

Image: http://www.hao.ucar.edu/research/stare/search.html

Some info: http://en.wikipedia.org/wiki/Astrometry

Radial velocity (new technique) - used mainly includes looking for Doppler shift. A light source is emitting a certain amount of wavelengths. As a star moves toward an observer, emits wave lengths like ripples in a pond. Ripples move as star moves and therefore get shorter as they come toward

the observer. Red shift: wavelengths moving away. Blue shift: wavelengths moving toward. Must be observed on at least a slight linear plane with solar system (cannot be looking from top down)

This method is good for finding large planets relatively close to its star.

- Gets average distance between star and planet.
- Detects lower limit if mass of planet.
- Can see circularity of orbit.

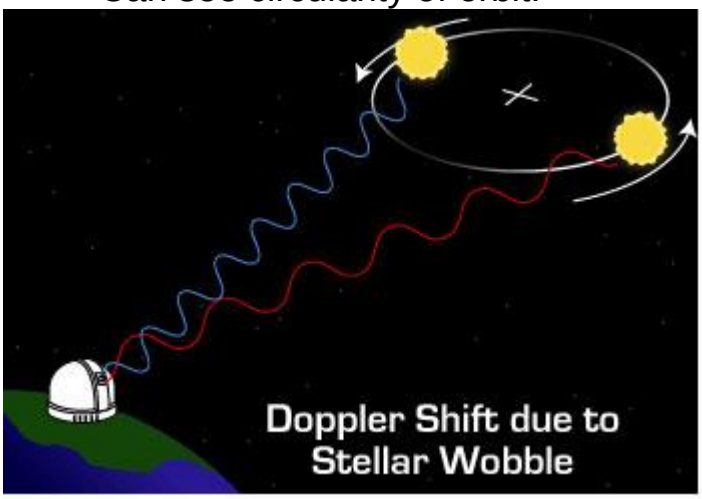

Image: http://planetquest.jpl.nasa.gov/science/finding_planets.cfm