This is the print version of the Skeptical Science article 'Other planets are warming', which can be found at http://sks.to/planets.

What climate change is happening to other planets in the solar system?

What The Science Says:
There are three fundamental flaws in the 'other planets are warming' argument. Not all planets in the solar system are warming. The sun has shown no long term trend since 1950 and in fact has shown a slight cooling trend in recent decades. There are explanations for why other planets are warming.

Climate Myth: Other planets are warming
"[E]vidence that CO2 is not the principle driver of warming on this planet is provided by the simultaneous warming of other planets and moons in our solar system, despite the fact that they obviously have no anthropogenic emissions of greenhouse gases.

Mars, Triton, Pluto and Jupiter all show global warming, pointing to the Sun as the dominating influence in determining climate throughout the solar system." (Ian McClintock)

The basis of this argument is that the sun must be causing global warming and in fact, warming throughout the solar system. There are several flaws in this line of thought. Firstly, the characterisation that the whole solar system is warming is erroneous. Around 6 planets or moons out of the more than 100 bodies in the solar system have been observed to be warming. On the other hand, Uranus is cooling (Young 2001).

Secondly, the theory that a brightening sun is causing global warming falls apart when you consider the sun has shown little to no trend since the 1950s. A variety of independent measurements of solar activity including satellite data, sunspot numbers, UV levels and solar magnetograms all paint a consistent picture. Over the last 35 years of global warming, sun and climate have been moving in opposite directions.

That begs the question - what is causing warming on other planets? With the exception of Pluto, climate change on other planets are fairly understood:

- Martian climate is primarily driven by dust and albedo. Global dust storms increase the surface albedo by settling brighter dust on dark surfaces. Higher albedo leads to more sunlight being reflected which has a cooling effect. Snapshots of Mars' surface in 1977 and 1999 find that the surface was brighter in 1977 and darker in 1999. However, this doesn't necessarily point to a long term warming trend - the 1977 snapshot was made shortly after a global dust storm while the 1999 snapshot occured before a dust storm. Consequently, there is little empirical evidence that long term global warming on Mars is occuring (Richardson & Vasavada 2007). More on Mars...
- Neptune's orbit is 164 years so observations (1950 to present day) span less than a third of a Neptunian year. Climate modelling of Neptune suggests its brightening is a seasonal response (Sromovsky et al. 2003). Eg - Neptune's southern hemisphere is heading into summer. More on Neptune...
- Neptune's largest moon, Triton, has warmed since the Voyager space probe visited it in 1989. The moon is approaching an extreme southern summer, a season that occurs every few hundred years. During this special time, the moon's southern hemisphere receives more direct sunlight (Elliot et al. 1998).
- Jupiter's storms are fueled by the planet's own internal heat (sunlight is 4% the level of solar energy at Earth). When several storms merge into one large storm (eg - Red Spot Jr), the planet loses its ability to mix heat, causing warming at the equator and cooling at the

poles (Marcus et al. 2006). More on Jupiter...

- Pluto's warming is not clearly understood. Pluto's orbit is much more elliptical than that of the other planets, and its rotational axis is tipped by a large angle relative to its orbit. Both factors could contribute to drastic seasonal changes. As Pluto's orbit is equivalent to 248 Earth years and observed warming spans only 14 years, it is likely this is a seasonal response (Sromovsky et al. 2003).

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Skeptical Science explains the science of global warming and examines climate misinformation through the lens of peer-reviewed research. The website won the Australian Museum 2011 Eureka Prize for the Advancement of Climate Change Knowledge. Members of the Skeptical Science team have authored peer-reviewed papers, a college textbook on climate change and the book Climate Change Denial: Heads in the Sand. Skeptical Science content has been used in university courses, textbooks, government reports on climate change, television documentaries and numerous books.

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