Astronomy Picture of the Day (2007 Oct. 15)

Jupiter’s Clouds from New Horizons

Dedicated to search for extraterrestrial intelligent life (SETI)

ATA: Allen Telescope Array

of 350-dishes when completed.

42 dishes now working

Seth Shostak:

“I think we will find signals from intelligent civilizations by 2025”

Advanced Question
Chap. 5, Q30 in P125

Jupitor's moon Io has an active volcano Pele whose temperature can be as high as 320°C.

(a) What is the wavelength of maximum emission for the volcano at this temperature? In what part of the electromagnetic spectrum is this?

(b) The average temperature of Io's surface is -150 °C. Compared with a square meter of surface at this temperature, how much more energy is emitted per second from each square meter of Pele's surface?

Advanced Question
Chap. 5, Q30 in P125

Answer:

(a) Using Wien's law. Convert temperature to Kelvins: T=320+273=593 K. Then $\lambda max=0.0029$ m K/593 K = 4.89 X 10^{-6} m ≈ 5 μm. This is in the infrared

(b) Using Steven-Boltzmann's law. Convert temperature to Kelvin: T=-150+273=123 K. Ratio of energy flux = $(593/123)^4$=540. Pele's surface radiates 540 times as much energy as of Io's surface per square meter