ESS-306 Midterm #2 Review Topics

NOTE: The word "planet" is used here, and elsewhere in this course, to refer to any planetary body, including satellites ("moons") and dwarf planets

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1. Five mechanisms for generating heat in planetary bodies and when each is active
2. Three mechanisms planets use for transferring interior heat towards the surface; and the one mechanism planets have for losing heat to outer space (net cooling).
3. Six quantities or properties of a planet that provide information about their interior, which can be observed from an orbiting spacecraft or from Earth (using a telescope), and what each tell us about the state, composition, structure and/or processes occurring there.
4. Topics related to planetary bulk density:
    a. **Terminology note**: "Bulk" density means the overall average density of a planet. It is equal to the mass of the planet divided by the volume, so the MKS units are kg/m^3.
    b. Typical density values (in kg/m^3) for liquid water, water ice, silicate rock, and metallic iron, in an uncompressed state (i.e. what you would measure in a lab).
    c. How the densities of ice, rock, and iron change with increasing pressure at greater and greater depths in a planet's interior. (Just the general trend, and the approximate range of values for each material expected for planets in our solar system – e.g. density of iron in Earth's inner core, density of ice at center of Callisto, etc.)
    d. What can we infer about the composition of a planet from its bulk density value; for example, 1100 kg/m^3 ? 2500 kg/m^3 ? 5500 kg/m^3?
5. The scenario described in Rothery (Chapter 2, Section 2.3.2) for the thermal evolution and partial differentiation of a mid-sized icy satellite that formed as a homogeneous ice/rock mixture at a uniform initial temperature of 100 K (see Rothery Fig. 2.3). How to explain the temperature profiles at "t1" and "t2", and how they correspond with composition changes.
6. Relative amounts of tidal heating on the Galilean satellites (Io, Europa, Ganymede, and Callisto) and how it affects them
7. Geomorphology and formation theories for the following features on Europa: double ridges, cycloid ridges, chaos (ice rafts)
8. The type(s) of magnetic field each Galilean satellite has and what that tells us about the state and composition of their interiors.
9. Processes thought to have resurfaced or degraded impact craters on each Galilean satellite
10. The Roche limit and its relation to planetary rings.
11. Evidence for internal heating of Enceladus, why it's surprising.
12. Unusual characteristics of Iapetus' equatorial ridge and the Dombard et al (2012) hypothesis for how it formed.
13. Evidence for the following geologic processes and features occurring on Titan, and the chemical compounds thought to be involved: fluvial erosion, fluvial transport, aeolian transport (saltation), lakes

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