November 2, 2015

Unit 18

Natural climate change, statistical nature of climate change, climate change happens at multiple timescales simultaneously (for example, getting warmer on the scale of centuries, but colder at the scale of tens of thousands of years), not everywhere experiences the same average change. Past climate indicators such as various geologic formations, ocean and lake bottom cores with pollen grains, microorganisms, etc, ice cores. Oxygen and carbon isotopes (O-18:0-16 ratio; more ice, richer O-18), many other climate change proxy measures. Ice-albedo feedback, CO2-weathering feedback, hot-house climate, ice-house climates, snowball earth, Paleocene-Eocene Thermal Maximum. Today's ice-house: glacial/interglacial cycles, last glacial maximum (LGM), sea level change, Milankovitch cycles, ice-core records, climate over the past 20,000 years, Younger Dryas, medieval climate anomaly, Little Ice Age, temps since 1850.

Unit 19

Human impacts on climate, global warming, anthropogenic climate change, anthropocene, Processes: adding heat, modifying the land surface, changing atmospheric composition Early Anthropocene hypothesis, temperature change in the industrial period, data making up global temperature records over the past 150 years – quality and trustworthiness, alpine glacier changes, spatial patterns of warming. Implicating humans in observed global warming, PCC, carbon isotopes show that the rising CO2 levels are due to fossil fuels as the carbon origin, other greenhouse gases such as methane, nitrous oxides, CFCs. General circulation models (GCMs) and understanding the temperature response to greenhouse gas emissions, modeling issues and model runs, forcings, different models and ensemble runs, simulations vs. observations, release scenarios (such as CO2x2), predictions from various scenarios & consequences, disappearing climates, water vapor increase and positive feedback, water-vapor feedback, climate change and weather extremes

Unit 20

Climate, soil, plants, and animals.pedology, biogeography (phytogeography, zoogeography). Geography of soils, soils as an interface between biotic and abiotic systems, rates of development, relationship of soils to biota, effects of farming. Biogeography, biogeography as a very visible response to global change, species, spatial distributions on the earth & why, threats to the biosphere & biodiversity such as erosion and forest destruction, example of Dust Bowl, conservation. Global carbon cycle, biomass, pools and fluxes, puzzle of the missing atmospheric carbon.