**Climate Change & *Unsettled* by Steven Koonin (Part 2)**

**Heat**

1. Many weather and climate extremes are the result of natural climate variability (including phenomena such as *El Nino*), and nat­ural decadal or multi-decadal variations in the climate provide the backdrop for anthropogenic (human-caused) climate changes. Even if there were no anthropogenic changes in climate, a wide variety of natural weather and climate extremes would still occur. (p. 99)

2. World Meteorological Organization: “Any single event, such as a severe tropical cyclone (hurricane or typhoon), cannot be attributed to human-induced climate change, given the current status of scientific understanding.” (p. 99)

3. “The record highs clearly show the warm 1930s, but there is no significant trend over the 120 years of observations, or even since 1980, when human influences on the climate grew strongly. In contrast, the numbers of record daily cold temperatures decline over more than a century, with that trend accelerating after 1985. These two panels together show something that is completely contrary to common perception—that temperature extremes in the contiguous US have become less common and somewhat milder since the late nineteenth century.” (p. 106-107)

**Storms**

1. National Climate Assessment: “There has been no significant trend in the global number of tropical cyclones nor has any trend been identified in the number of US land-falling hurricanes.” (p. 117)

2. Climate Science Special Report: “Furthermore, it has been argued that within the period of highest data quality (since around 1980), the globally observed changes in the environment would not necessarily support a detectable trend in tropical cyclone intensity. That is, the trend sig­nal has not yet had time to rise above the background variability of natural processes.” (p. 119)

3. NOAA: “In other words, as human influences have grown since the middle of the twentieth century, the number of sig­nificant tornadoes hasn't changed much at all, but the strongest storms have become less frequent.” (p. 123)

**Precipitation (**IPCC AR5—Fifth Assessment Report)

1. Low confidence regarding the sign of trend in the magnitude, and/or frequency of global floods

2. Low confidence in observed trend in global drought or dryness since the middle of the 20th century

3. Low confidence in trends in small-scale severe weather phenomena such as hail and thunderstorms

4. Low confidence in large scale changes in the intensity of extreme extratropical cyclones since 1900 (p. 98)

**Sea level**

1. [The IPCC’s] “report offers projections of Global Mean Sea Level rise under the various emissions scenarios…Under RCP2.6 (the emissions-lite scenario)…the IPCC projects levels will rise 0.43 m over the 21st century, while for the emissions-heavy RCP8.5, projected rise is 0.84 m.” (p. 161-162)

2. “A recent article about local sea level rise on Oahu, Hawaii…failed to mention that the NOAA tide gauge record for Honolulu shows an average rate of 1.5 mm (0.06 inches) of rise per year since 1905, meaning that, absent some *very* dramatic acceleration, it would take two hundred years to achieve even the lowest mapped rise of 30 cm (one foot).” (p. 165)

3. “In summary, we don't know how much of the rise in global sea levels is due to human-caused warming and how much is a product of long-term natural cycles.” (p. 165)

**Weather-related deaths**

1. “One takeaway from [the Centre for Research on the Epidemiology of Disasters] is that weather-related death rates fell dramatically during the past one hundred years even as the globe warmed 1.2°C (2.2°F); they're about 80 times less frequent today than they were a century ago. That's largely due to better tracking of storms, better flood control, better medical care, and improved resilience as countries have developed. A recent UN report confirms the trend over the past two decades.” (p. 169)

2. “The World Health Organization has said that indoor air pollution in poor countries—the result of cooking with wood and animal and crop waste—is the most serious environmental problem in the world, affecting up to three billion people. This is not the result of climate change. It’s the result of poverty.” (p. 171)

3. [The IPCC Special Report notes] “in the fifty years from 1961 to 2011, global yields of wheat, rice, and corn have each more than doubled, and US corn yields have more than tripled…[It also notes] during the past four decades the Leaf Area Index (the fractional area covered by leaves) observed by satellites has increased markedly (‘greened’) over 25-50 percent of the vegetated areas of globe, while it has decreased (‘browned’) over less than 4 percent of the globe.” (p. 173-174)

**Critical thinking and honesty**

1. “As a scientist, I'm disappointed that so many individuals and organiza­tions in the scientific community are demonstrably misrepresenting the science in an effort to persuade rather than inform. But you also should be concerned as a citizen. In a democracy, voters will ultimately decide how society responds to a changing climate.” (p. 196)

2. Watch for red flags that should cause skepticism:

*- Using term "denier" or alarmist" (that’s politics or propaganda)*

*- Appeal to "97% consensus" among scientists (that study has been debunked)*

*- Confusing weather and climate*

*- Omitting numbers**("sea level is rising")*

*- Quoting alarming quantities without context*

*- Non-experts with projections (“might be,” “as much as,” “can’t be ruled out”)*

**Final considerations**

1. Koonin’s points in the *New York Times* (11/2015)

*- “According to the IPCC, just stabilizing human influences on the climate would require global annual per capita emissions of CO2 to fall to less than one ton by 2075…annual per capita emissions from the US, Europe, and China, were, respectively, about 17, 7, and 6 tons*

*- Global energy demand is expected to grow by about 50 percent through midcentury*

*- Fossil fuels supply 80% of the world’s energy today and remain the most reliable and convenient means of meeting growing energy demand*

*- Energy supply infrastructure changes slowly for unavoidable structural reasons (energy plants, transmission lines, refineries, and pipelines)*

*- Emission reductions and economic development is complicated by uncertainties in how the climate will change under human and natural influences” (p. 213)*

2. “In fact, according to the UN's IPCC, if the goal is to limit warming to 2°C, global carbon dioxide emissions must *vanish* by 2075; if the goal is a rise of no more than 1.5°C, this date becomes 2050, just thirty years from now? In other words, to achieve the stated Paris goals, the world must almost completely forswear fossil fuels within the next thirty to fifty years.” (p. 216)

3. “In contrast, almost all high-emitting developing economies are expected to increase emissions significantly by 2030—China and India are building coal-fired power stations that will double and triple their emissions, respectively, while Russia (the world's fourth largest emitter) also proposes investments that will increase its emissions substantially.” (p. 223)

4. “Unless emissions-lite technologies are developed to the point where they are essentially no more costly than emitting technologies, or efforts like the Green Climate Fund become much more substantial, it's natural to ask ‘Who will pay the developing world not to emit?’ I have been posing that simple question to many people for more than fifteen years and have yet to hear a convincing answer.” (p. 224)

5. “Transportation, electricity generation, and industrial activities account for the great majority of emissions and, importantly, neither the major sources of emissions nor their amounts have changed all that much over the past thirty years…to "get to zero," agriculture, residential, and commercial emissions would also have to be dealt with, either by direct reductions or by offsetting activities like growing more trees that remove CO2 directly from the atmosphere.” (p. 226)

6. “Energy systems change slowly for good reasons. An important one is that delivery of energy must be highly reliable—when fuel supplies are disrupted or there's an electrical blackout, society comes to a halt and chaos ensues…Energy supply facilities must also be compatible with other parts of the infrastructure—fuels, fueling infrastructure, and vehicles.” (p. 228)

**Adaptation will be our primary response—proportional, local, and autonomous**