Human Effects on Climate are Reality, not Science Fiction

Recently, Senator Ted Cruz claimed that debates about the reality of global warming should "follow science and follow data". We couldn't agree more. Following the science tells us two basic things: fossil fuel burning increases atmospheric levels of heat-trapping greenhouse gases, and greenhouse gas increases warm the planet. Following the data confirms that the planet's surface is warming, the heat stored in the oceans is increasing, sea-level is rising, and glaciers are retreating[1,2,3]. Together, science and data show that the climate changes observed over the last 30 to 50 years can't be explained by natural causes alone[4,5].

According to Senator Cruz, human effects on climate are science fiction rather than science fact. The Senator argues that a single observational data set – satellite estimates of Earth's atmospheric temperature – disproves global warming. This argument is incorrect.

Satellite temperature data sets have been in development for 25 years. They evolved markedly over time as scientists identified well-documented problems[6,7,8,9] in translating what the satellites actually measure – the microwave emissions of oxygen molecules – into estimates of atmospheric temperature. There is no indication that this evolutionary process is over[10,11]. A key lesson learned is that no single source of observed data should ever be viewed as unambiguous truth[12,13].

In "following the data", it's important to follow *all* of the data, and not just a small portion of it. Senator Cruz claims that satellite data show "zero warming" of Earth's atmosphere over the last 17 years. He is silent on important uncertainties in the satellite data. He does not mention many other independent measurements consistent with warming since 1998 (such as continued sea-level rise and ocean heat content increases). He does not point out that temperature trends calculated

over short periods of climate record can be strongly affected by the year-to-year "noise" of natural climate variability[14]. By selecting a single 17-year period that begins with an extremely warm year (1998), Senator Cruz obtains a period with little warming in the satellite atmospheric temperature records. He ignores the fact that the same satellite data, when examined over the full 36-year period of the observational record, show pronounced warming of the lower atmosphere, providing scientific evidence of a human influence on global climate[15,16].

We respectfully urge Senator Cruz to heed his own wise advice, and "to follow science and follow data." The many climate science reports of the U.S. National Academy of Sciences would be a good starting point[17,18].

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