

A Half-century Record of State-by-State Changes in Fossil-Fuel Carbon Emissions and Corresponding Isotope Ratios in the United States

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A record of annual state-by-state fossil-fuel carbon emissions from solid, liquid and gaseous fuels in the United States (US) since 1960 is now available for analysis. We focus on the period from 1960-2010. The spatial pattern of emissions, and of the ^{13}C signature of the emitted carbon, changes with events such as the peaking of oil/gas production in certain states, discovery of the Prudhoe Bay Oil Field and subsequent construction of the Alaskan Pipeline, and large-scale switching from heating oil to natural gas in the northeastern US as oil becomes more expensive and new gas pipelines are installed. From 1960-2010 the northeastern states were generally characterized by decreases in ^{13}C ratios and in per-capita carbon emissions. Largest increases in ^{13}C ratios were between the Rocky Mountains and the Mississippi River, and in Arizona and New Mexico. Largest increases in per-capita emissions were in coal-rich low-population states that export much electricity to other states. From 2000-2010 per-capita carbon emissions increased in only 5 states; new coal fired power plants were partly responsible for some of these increases, although a large increase in natural gas consumption was sometimes a strong influence. Per-capita emissions in other states declined from 2000-2010, while ^{13}C ratios also declined in 36 states plus the District of Columbia; these changes reflect decreased use of coal, increased use of natural gas, and increasing motor fuel economy.

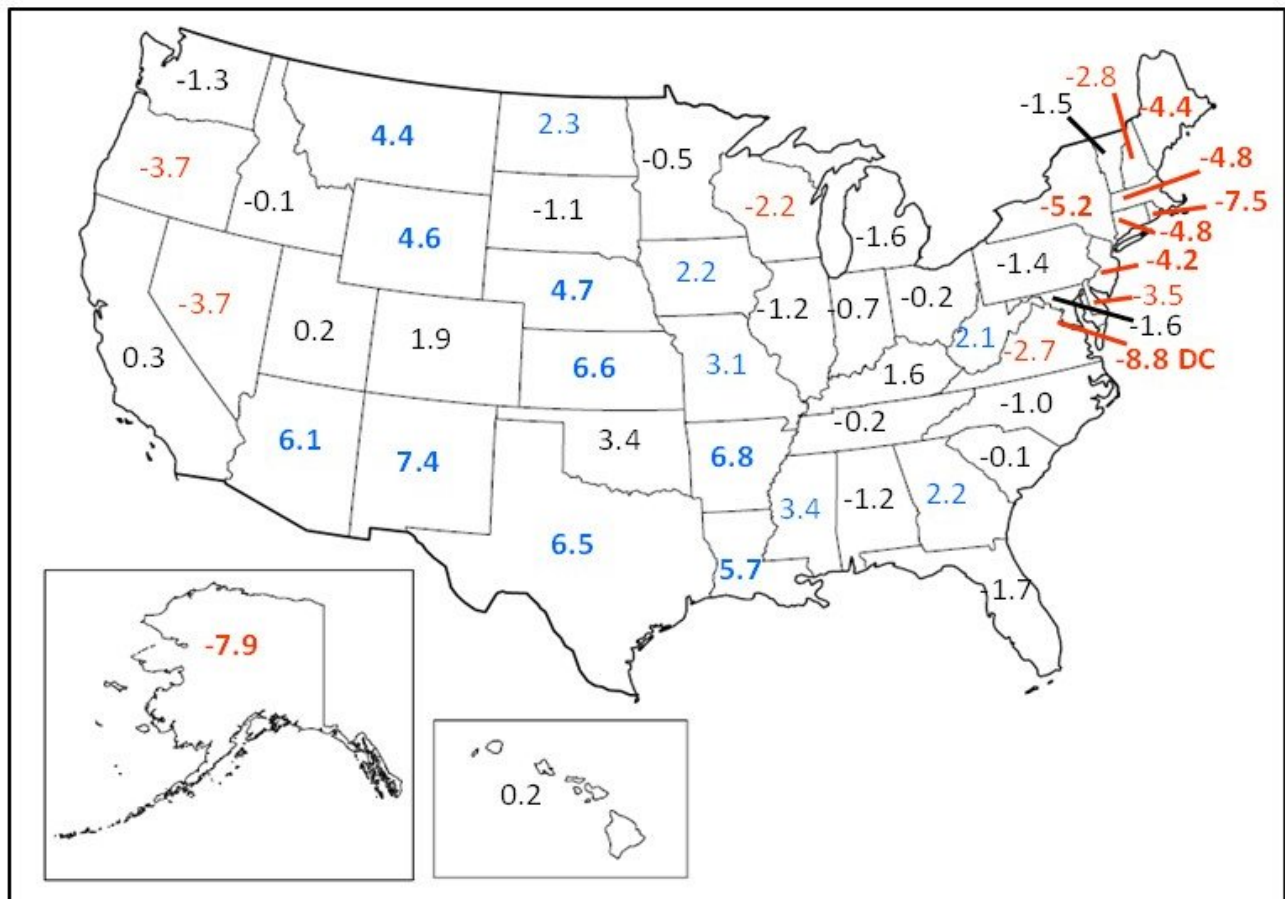


Figure 1. 1960-2010 change in the pattern of ^{13}C isotope ratio in fossil-fuel carbon emissions in the United States. Changes of greater than 2.0 are colored red if negative, blue if positive. Values greater than 4.0 in either direction are in bold.