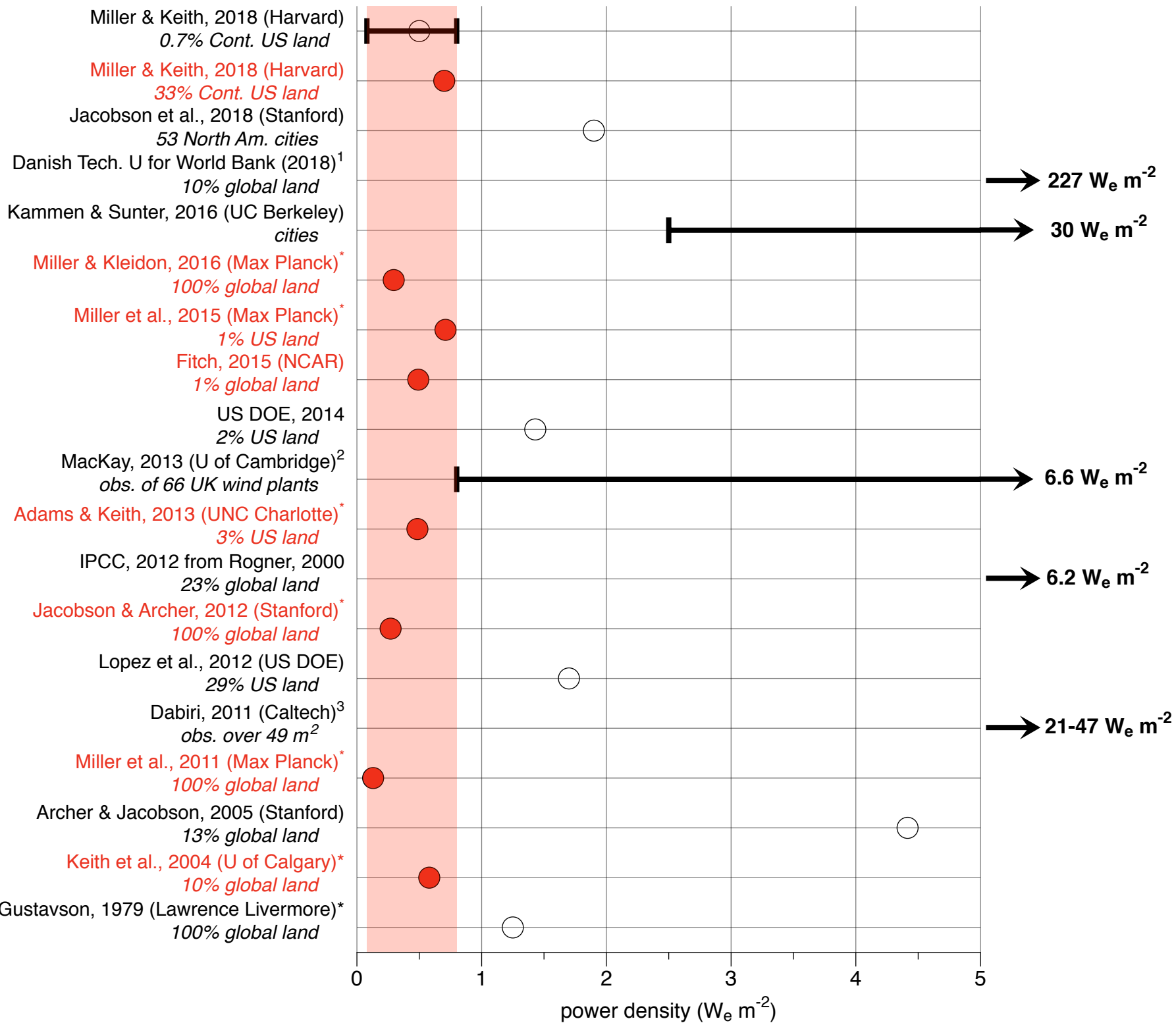


# First large-scale direct observation of wind energy's power density is consistent with physically-based models and inconsistent with wind resource estimates that ignore interactions between wind turbines and the atmosphere

Red studies indicate model-based estimates that consider turbine-atmosphere interactions; red range is 10-90<sup>th</sup> percentiles of US wind farms observed in Miller & Keith (2018) in ERL



[\*] for studies that compute power density limits (saturation), we report half the limit

[1] "The mean power density is a measure of the wind resource," (<https://globalwindatlas.info>); used in McKinsey & Co. Exhibit 8 in *Decarbonization of industrial sectors: the next frontier*

[2] relatively small wind power plants (range: 0.14-13.3km<sup>2</sup>, avg=2.4 km<sup>2</sup>)

[3] "Averaged over the 48.6 m<sup>2</sup> footprint of the six-turbine VAWT [vertical axis wind turbine array]..." "in vacant desert...[with] topography [that] is flat for approximately 1.5 km in all directions"

used in Kammen & Sunter (2016) for city-scale estimate; see our 2 eLetter responses at <https://tinyurl.com/EstTooHigh>