风力发电有望为全球提供电力 但其对全球气候将产生巨大影响

事情往往都有相对的两面性，风力发电也不例外。好消息是如果对于海风资源的新研究是快速和可靠的，并且可以找到一种有效利用它们的方式，我们可以在不需要化石燃料的情况下为全球提供电力。而坏消息是：实际上使用这种风能来发电可能会以潜在的危险和不可预测的方式大大改变气候。

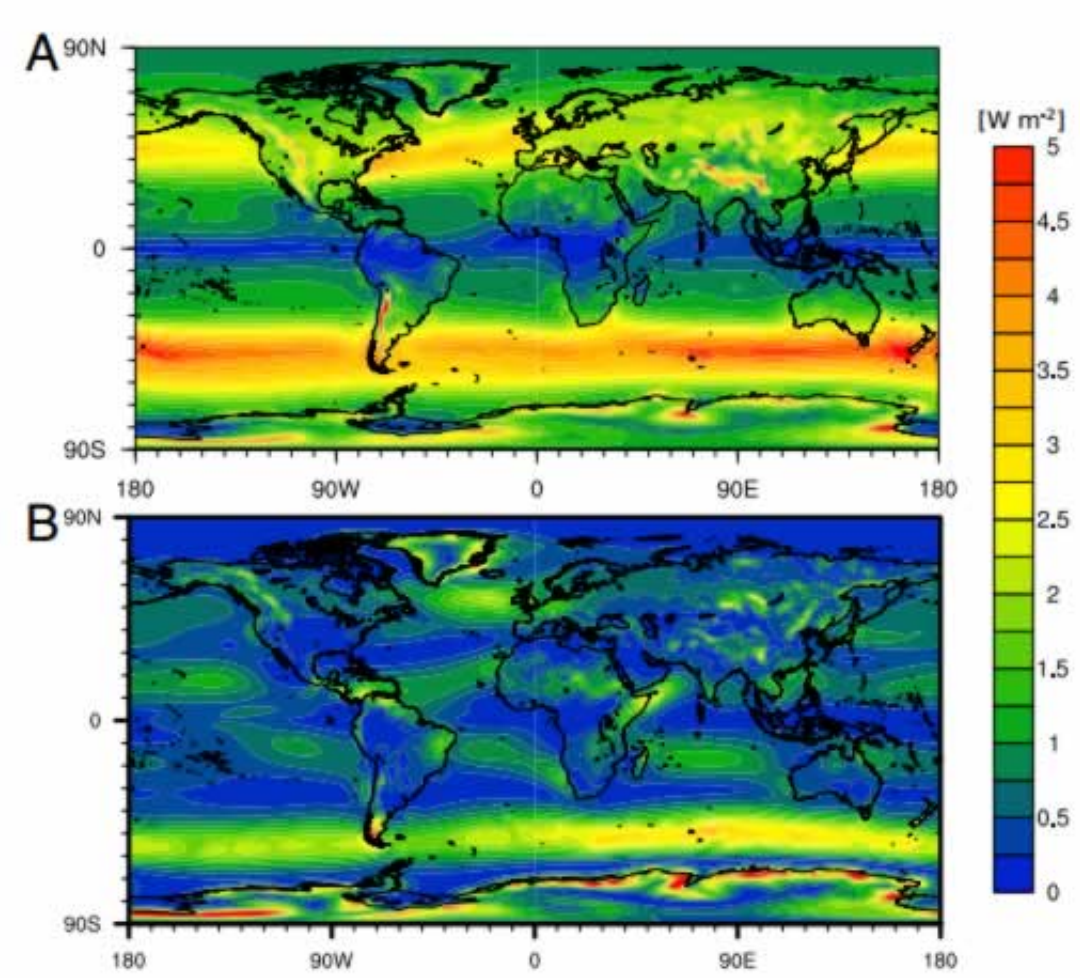

Fig. 1. (*A*) Climatology of kinetic energy extraction (KEE) rate for a globally homogeneous wind turbine density of one per 1 km^2, including turbine–atmosphere interactions. (*B*) Annual mean kinetic energy (KE) dissipation into the boundary layer for the preindustrial climate.

美国卡耐基梅隆大学的Anna Possner领导的研究团队近日在《美国国家科学院院刊》上发表了一篇相关论文。在这项研究中，团队利用模拟风电场来探索其对气候模式造成的严重破坏。

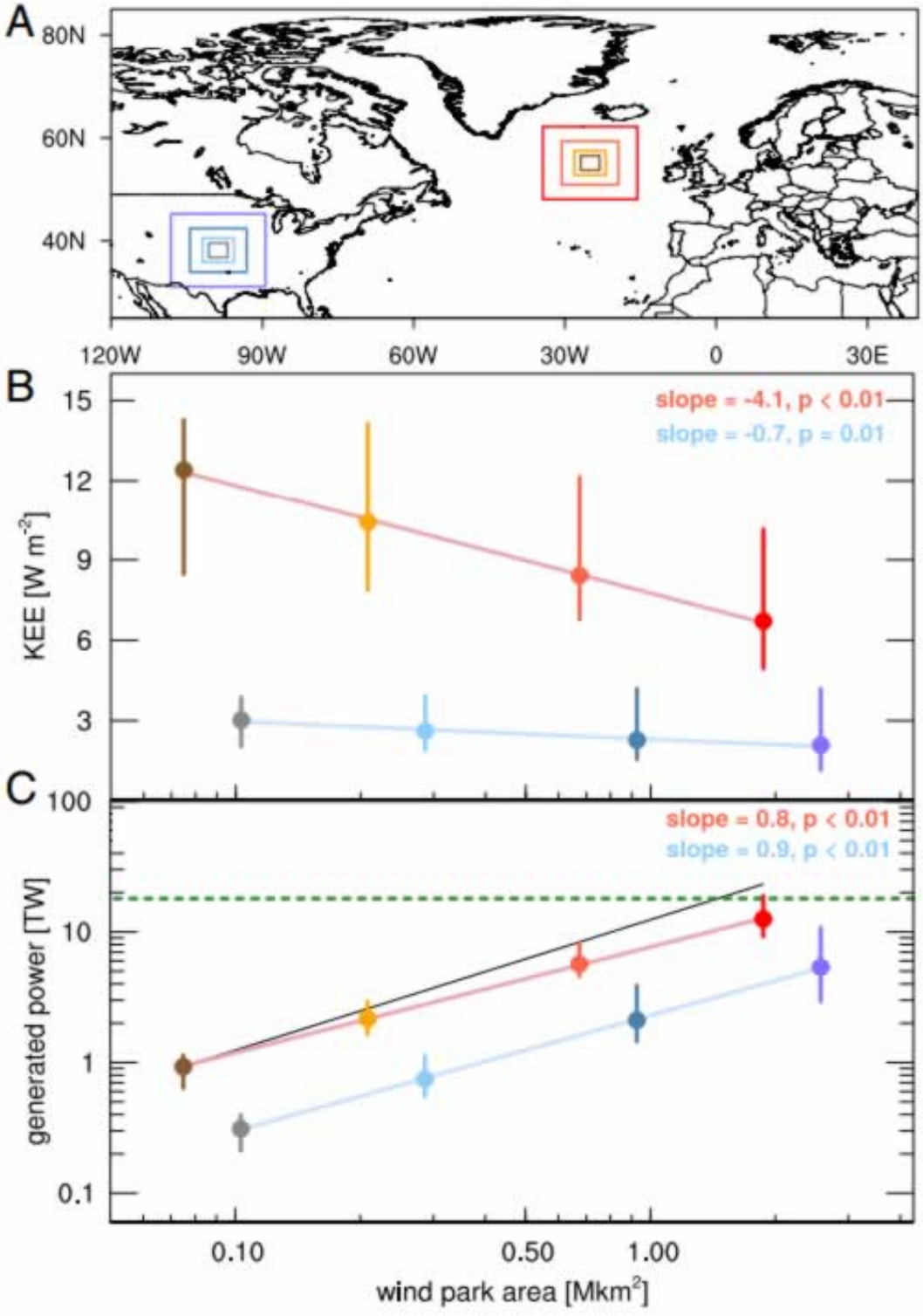

Fig. 2. (*A*) Map of wind farm locations. (*B* and *C*) Regional medians (•) and minimum–maximum ranges (lines) of annual mean kinetic energy extraction (KEE) in (*B*) watts meter^{-2} and (*C*) terawatts as function of wind farm area. Linear regression is fitted through the median KEE points against the common logarithm of the wind farm areas in the North Atlantic (salmon) and North America (light blue). Slopes and *P* values of fit are given. Precise KEE values and areas are in Table S1.

风力发电已经在世界各地使用，其潜能也是不可估量的。这是一项了不起的技术，但它伴随着对地球气候的潜在巨大影响。这项研究揭示了一个为全球提供的大型风力发电厂的“大型非局部气候影响”的潜力，但这并不意味着我们必须完全忽视海洋风能的潜力。研究人员表示，这不是一个全然或全无的情况，如果注意放置海洋风力装置的地点，我们可以大大减少对其他能量形式的依赖，同时避免对地球气候造成任何重大影响。

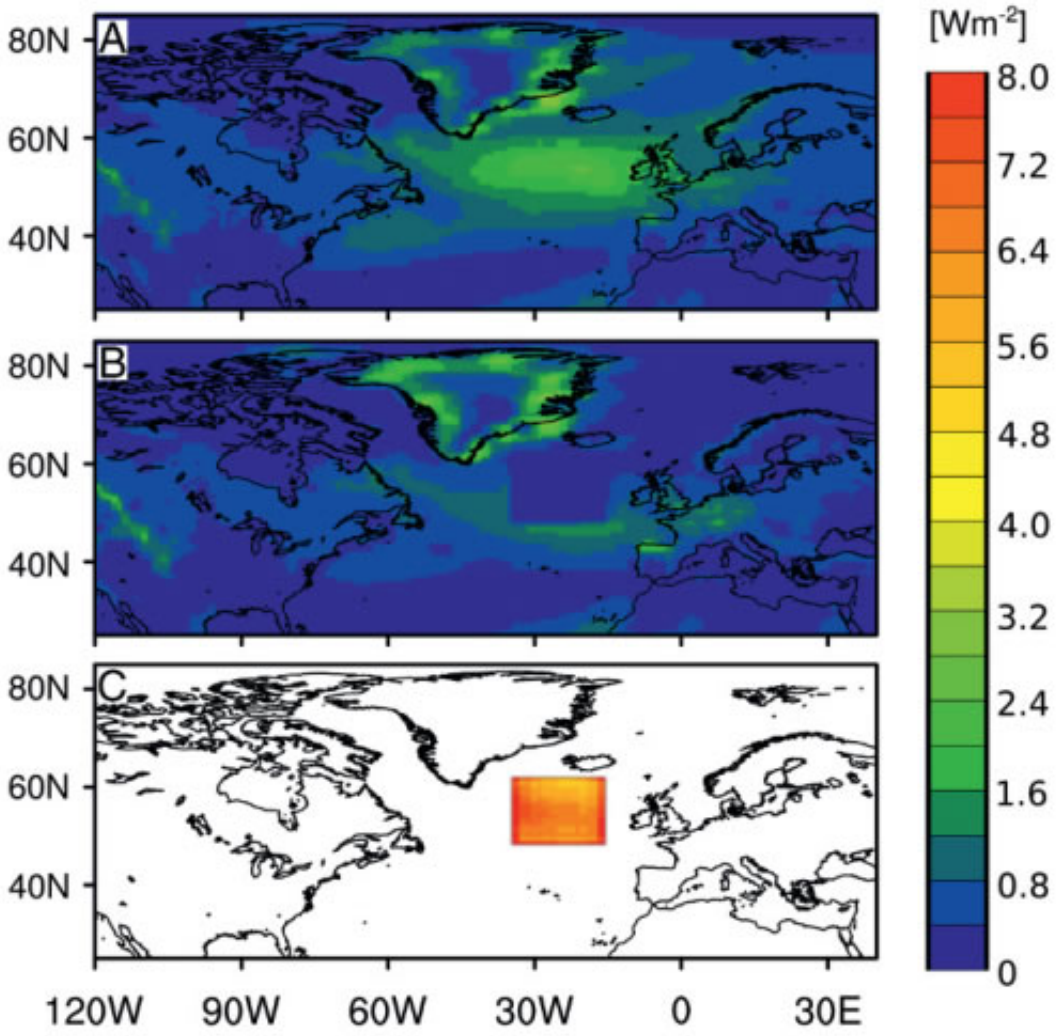

Fig. 3. Annual mean near-surface kinetic energy (KE) dissipation caused by drag (*A*) in the preindustrial climate and (*B*) for the largest simulated wind farm in the Atlantic with an area of 1.9 Mkm^2. (*C*) Kinetic energy extraction (KEE) within the largest wind farm in the North Atlantic. KE extracted by wind turbines is partially compensated for by a reduction in KE dissipation into the boundary layer caused by surface drag. Surplus energy extracted locally is compensated for by a regional decrease of KE dissipation into the boundary layer outside the wind farm.

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