

## 《《涓流细雨》》 编辑：贾朋群

“Nordhaus was in a position early on to think about climate change from a human-welfare and well-being perspective. Without him, there wouldn't be such a subject of climate economics.”

“Nordhaus是早期从人类福祉的角度思考气候变化的学者，没有他也不会有气候经济学这样的学科。”

——2018年诺贝尔经济学奖由两位美国经济学者William Nordhaus和Paul Romer分享，以表彰他们将气候变化和技术改变融入宏观经济学之中，后者研究经济学作为一个整体的行为，而在讨论气候变化对社会经济的影响时，整体视角是最佳的路径。针对本次获奖者，德国波茨坦气候影响研究所主任Ottmar Edenhofer如此评论来自耶鲁大学、创建了气候变化经济学的获奖者之一Nordhaus的学术思想和影响。

“As a first step to demonstrating how this type of satellite measurements could be used, we chose nine sites in all – sites in the US, Europe, Africa and Australia. We took four satellite missions that observe soil moisture and we were able to measure the amount of water applied for irrigation between two consecutive soil-moisture measurements from space.”

“第一步要展示这类卫星的观测如何被利用，我们选择位于美国、欧洲、非洲和澳大利亚的总计9个地点。我们利用4种可观测土壤湿度卫星，从空间测得两次连续土壤湿度观测之间灌溉的水供给量。”

——世界上约70%的淡水资源被用于农业灌溉，这也是人类“干扰”全球水循环最主要的方式。意大利学者Luca Brocca领导的团队致力于用卫星探测数据解释农业灌溉用水的细节，他对这项即将发表的研究成果进行了如上表述。

“As glaciers thin around the world, they are modifying their landscapes dramatically. In the case of Taan Fjord, the result was a massive tsunami. The tsunami was triggered by a massive landslide in October 2015 that occurred above a glacier that had retreated dramatically in the late 20th century. We need to better understand the risk posed by these steep slopes in a changing climate. Our results call attention to an indirect effect of climate change that is increasing the frequency and magnitude of natural hazards near glaciated mountains.”

“当全球冰川萎缩时，会大幅度改变其特征。对Taan Fjord冰川而言，带来的结果就是巨大海啸的发生。海啸因2015年10月发生在20世纪后期严重退缩的冰川之上的大规模滑坡触发，我们需要更好地认识气候变化中这些陡坡造成的风险。我们的结果提示要关注气候变化的间接影响，即冰川山区附近自然灾害的频率和量级的增加。”

——气候变化给冰川地区带来的变化无疑是最大的。2015年阿拉斯加发生浪高达200 m的海啸，是有记载以来的最大记录。这次海啸因冰川融化引发，美国华盛顿大学地球科学助理教授Dan Shugar及其团队针对冰川消融带来的灾害风险展开研究并发表了研究结果。

“Clouds play a major role in the Earth's climate by

transporting heat and moisture, reflecting and absorbing the sun's rays, trapping infrared heat rays and producing precipitation. But they can be as small as a few hundred meters, much tinier than a standard climate model grid resolution of 50 to 100 kilometers, so simulating them appropriately takes an enormous amount of computer power and time. But a lack of supercomputer power, or the wrong type, means that this is still a long way off. Meanwhile, the field has to cope with huge margins of error on issues related to changes in future rainfall and how cloud changes will amplify or counteract global warming from greenhouse gas emissions.”

“云通过传输热量和水汽，反射和吸收太阳辐射，吸收红外热辐射和产生降水，在地球气候中起重要作用。但是云可以小到几百米，较标准的气候模式50~100 km的网格分辨率小很多，所有模拟云需要消耗大量的计算资源和时间。然而，缺乏超级计算能力或计算方式不妥意味着还有很长的路要走。与此同时，这一领域含有与未来降水以及云变化如何放大或抵消温室气体排放导致变暖等相关问题的巨大误差。”

——美国和德国学者面对气候变化模式中云模拟的难题，试图探索机器深度学习是否能够带来一种有效、客观和数据驱动的其他方案，能够快速应用于气候预测。该方法基于模仿人类思考和学习技能的算法，试图解决气候模式次网格问题。研究成果已经在PNAS发表，论文第二作者、助理教授Michael Pritchard对这些工作的意义，表达了上述看法。

“These contracts represent another step toward bringing commercial sector innovation to NOAA's mission of delivering life-saving weather forecasts and warnings. By collaboratively testing commercial sector capabilities and new business models, we continue to optimize the impact of our observations and reduce costs for taxpayers.”

“这些合同代表将商业领域创新纳入NOAA挽救生命天气预警使命的又一个步骤。通过合作验证商业圈的能力及新的商业模式，我们继续优化观测的作用和减轻纳税人的负担。”

——NOAA宣布继续投入840万美元购买3家私人卫星数据商的卫星无线电掩星数据。这3家中标机构（获得资助经费）分别是Spire Global（142.5万美元）、PlanetIQ（350万美元）和GeoOptics（344万美元）。据悉，这是该机构第二次资助私人卫星数据提供商，2016年NOAA曾经分别向Spire Global（37万美元）和GeoOptics（69.5万美元）提供了总计超过100万美元的私人商业卫星天气数据合同。在美国终止与中国台湾合作开展第二阶段无线电掩星气象数据项目后，今年NOAA显然加强了这一商业天气数据购买示范项目的投入力度，该局的卫星和信息局官员Karen St. Germain针对本次购买合同表示了上述看法。

““We determined that in the first eight days post-landfall, 30 percent of Harvey's stormwater was captured or stored on land -- most as standing water that sits on the surface. Around 60 percent was lost or drained into the ocean and Galveston Bay over the first few days after the storm, and the remaining 10 percent was lost via evapotranspiration, or a combination of evaporation and plant transpiration,” said first author Chris Milliner of NASA's Jet Propulsion Laboratory in Pasadena, California.”

“我们确定，在登陆后的前8天，“哈维”飓风导致降水中有30%被捕获或储存在陆地上——最主要的是以地面上的积

水形式。在风暴过后的最初几天，大约有60%的水流失或排入海洋和加尔维斯顿湾，剩下的10%因蒸发蒸腾作用或者是蒸发和植物蒸腾作用的结合而消失。”

——2017年“哈维”飓风引发的得克萨斯州东南部降水，过程雨量达到1.5 m，成为美国创记录的最湿飓风。那么这些降水在飓风登陆后流向哪里了？美国NASA学者基于GPS技术在最新的研究里回答了这个问题，该论文的第一作者，来自JPL的Chris Milliner描述了这次飓风降水的去处。

“ESA’s SMOS mission can give us really interesting new information for operational storm forecasting, which we hope to use along with our traditional sources of data. SMOS measurements can help us keep track of the structure of a dangerous storm. Combining SMOS data with that from its US counterpart SMAP mission, will give us more timely information which is essential for monitoring major storms.”

善变的美国总统 Donald Trump 针对气候变化的表态，根据媒体报到，似乎发生了某种改变，以下是其接受记者 (Lesley Stahl) 采访时最开始的几句对话：

Lesley Stahl: Do you still think that climate change is a hoax?  
(你还认为气候变化是骗局吗?)

Donald Trump: I think something’s happening. Something’s changing and it’ll change back again. I don’t think it’s a hoax, I think there’s probably a difference. But I don’t know that it’s manmade. I will say this. I don’t wanna give trillions and trillions of dollars. I don’t wanna lose millions and millions of jobs. I don’t wanna be put at a disadvantage.

(我想是发生了什么。有时有改变但最后还要变回来。我不认为它是骗局，我想有可能有差别。但是我不知道它是人为造成的，我只能这么说。我不想投入大量金钱。我不想失去大量工作岗位。我不想处于不利地位。)

Lesley Stahl: I wish you could go to Greenland, watch these huge chunks of ice just falling into the ocean, raising the sea levels.  
(我希望你能去格陵兰，看看巨大冰块掉进海里，让海面抬升。)

“ESA的SMOS卫星确实能够提供用于风暴预报的新信息，这些新数据我们将和传统数据源结合利用。SMOS观测能帮助我们跟踪危险风暴的结构。将SMOS与美国类似的SMAP卫星结合起来，能提供监测风暴更及时的核心信息。”

——2018年飓风和台风分别在世界各地造成灾害。在对这些灾情进行预测和监测过程中，欧洲空间局 (ESA) 发射的SMOS卫星 (Soil Moisture and Ocean Salinity, 土壤湿度和海洋盐分卫星) 发挥着独特作用。SMOS主要通过L波段微波传感器获得亮温图像，获得地表辐射，从而得到土壤湿度和海洋盐分信息，该图像具有穿透云和雨层的能力。强烈风暴能干扰这些信息的获取，但反过来也提供了风暴本身的信息 (如风速等)。美国海军研究实验室的Buck Sampson介绍了该卫星针对风暴预报的用途。

Donald Trump: And you don’t know whether or not that would have happened with or without man. You don’t know.  
(可你不知道有人类和没有人类时这些是否会发生，你不知道。)

Lesley Stahl: Well, your scientists, your scientists--  
(好，你的科学家，你的科学家。。。。。。)

President Donald Trump: No, we have--  
(不知道，我们有科学家。。。。。。)

Lesley Stahl: At NOAA and NASA--  
(在NOAA和NASA。。。。)

Donald Trump: We have scientists that disagree with that.  
(我们有科学家不同意这样的说法。)

(from back cover)

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