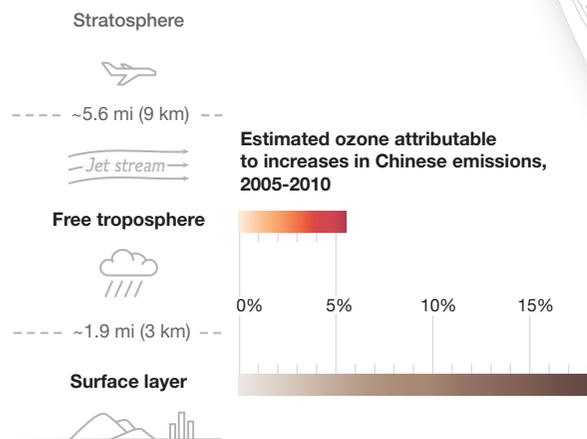


Pollution on the Move

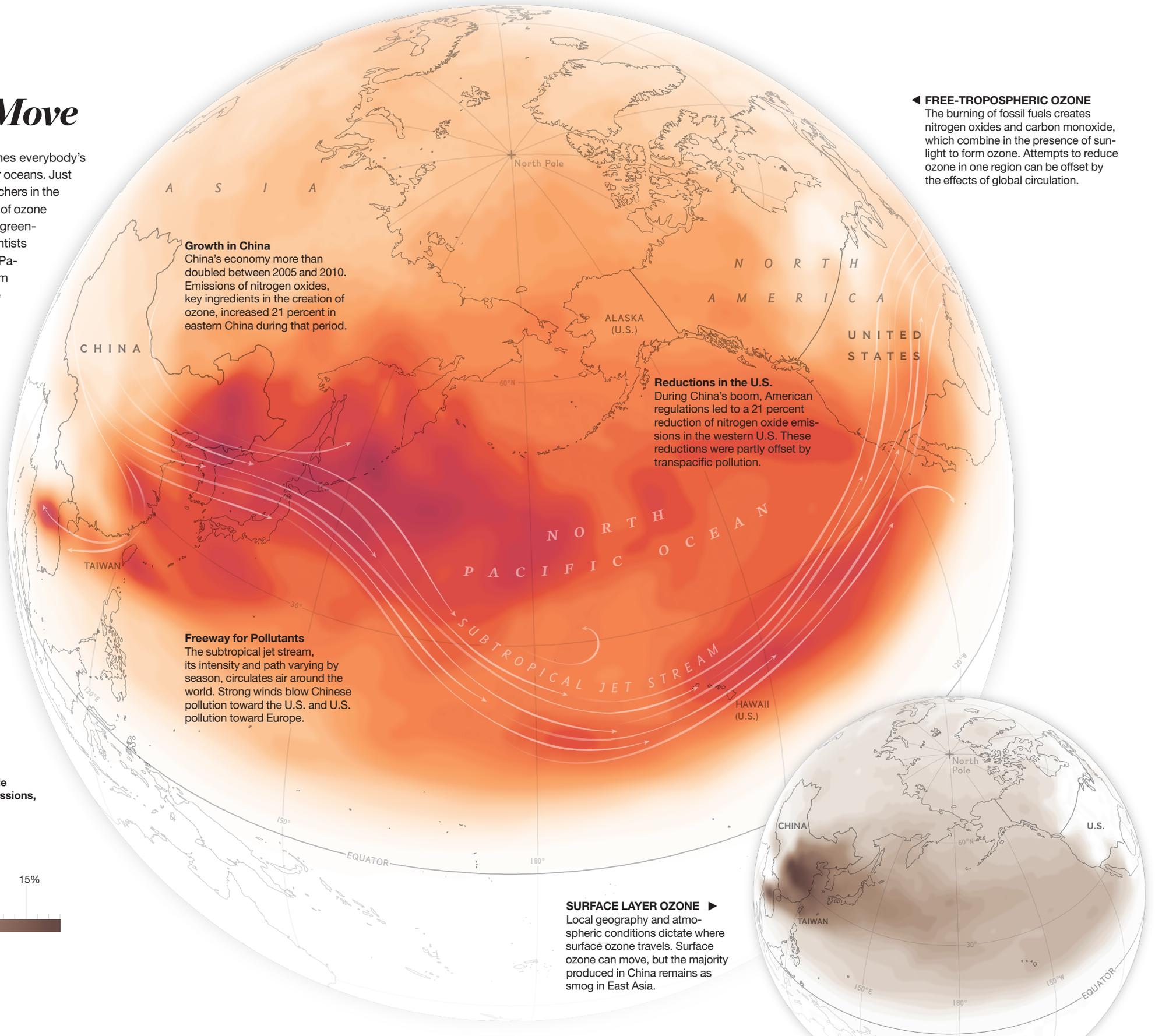
Pollution always starts locally, but it quickly becomes everybody's problem, irrespective of treaties, national borders, or oceans. Just how quickly—and how far—does it spread? Researchers in the Netherlands and the United States tracked the path of ozone from a major source—China, the world's biggest greenhouse gas emitter. Using satellite imagery, the scientists discovered that China's ozone traveled across the Pacific Ocean to the West Coast of the U.S., where, from 2005 to 2010, it offset American reductions of ozone pollution by 43 percent.

The danger of pollution depends on how low it is. Most ozone (one of the easier gases to track) stays close to the surface, where too much can constrain plant growth and animal respiration. Ozone can travel farther in the free troposphere, where it acts as a greenhouse gas yet also breaks down air contaminants. Even higher, stratospheric ozone protects the planet from radiation.

China's growing economy explains its increasing pollution. But every major emitter's pollution travels (in the U.S.'s case, toward Europe). "We wanted to demonstrate the global impact of local pollution emissions and how it can interfere with measures...taken overseas," says atmospheric chemist Willem Verstraeten—or in other words, show that all emissions can have an effect elsewhere. —Daniel Stone



ANDREW UMENTUM, NGM STAFF
SOURCE: WILLEM W. VERSTRAETEN AND OTHERS, NATURE GEOSCIENCE



Growth in China
China's economy more than doubled between 2005 and 2010. Emissions of nitrogen oxides, key ingredients in the creation of ozone, increased 21 percent in eastern China during that period.

Reductions in the U.S.
During China's boom, American regulations led to a 21 percent reduction of nitrogen oxide emissions in the western U.S. These reductions were partly offset by transpacific pollution.

Freeway for Pollutants
The subtropical jet stream, its intensity and path varying by season, circulates air around the world. Strong winds blow Chinese pollution toward the U.S. and U.S. pollution toward Europe.

◀ **FREE-TROPOSPHERIC OZONE**
The burning of fossil fuels creates nitrogen oxides and carbon monoxide, which combine in the presence of sunlight to form ozone. Attempts to reduce ozone in one region can be offset by the effects of global circulation.

▶ **SURFACE LAYER OZONE**
Local geography and atmospheric conditions dictate where surface ozone travels. Surface ozone can move, but the majority produced in China remains as smog in East Asia.