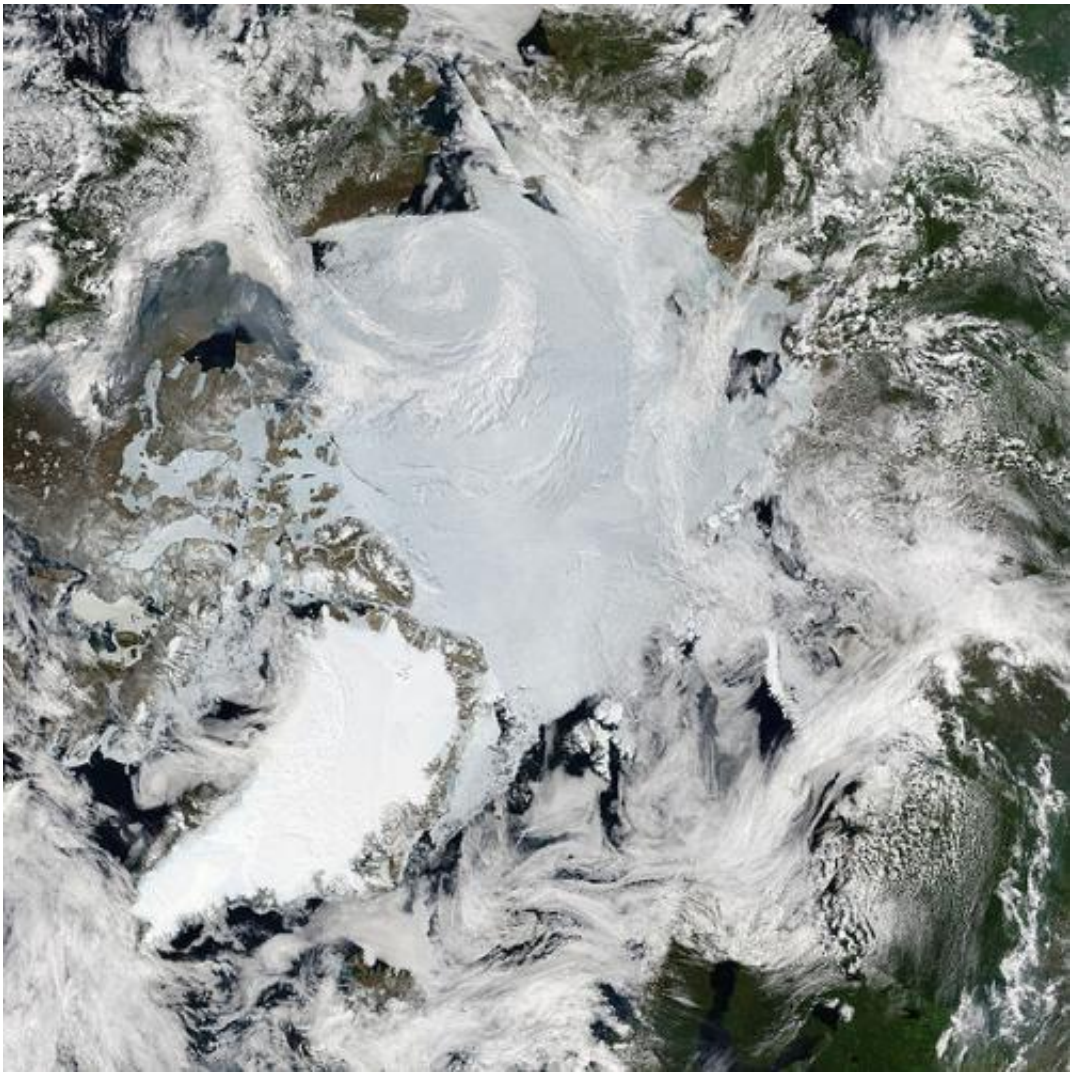
# Bird excrement may be cooling the Arctic

November 16 2016, by Bob Yirka



Mosaic of images of the Arctic by MODIS. Credit: NASA

(Phys.org)—A team of researchers with members from Canada, Sweden

and U.S. has found that bird excrement may be playing a role in cooling the Arctic during its warmer months. In their paper published in the journal *Nature Communications*, the team describes how they found higher than expected seasonal levels of ammonia in the air during trips they took to Arctic sites, how they traced it to bird feces and then modeled the impact it might be having on the local environment.

As the researchers note, millions of birds migrate to Arctic regions during the warmer months, covering much of the local landscape with guano. Until now, however, no connection between such droppings and temperature changes was ever made. During a trip to the Canadian Arctic two years ago, the researchers collected air samples for study. In analyzing those samples, the researchers found that during certain times of the year (when it was above freezing), there was a noticeable rise in ammonia levels. They report that they initially thought the ammonia was coming from the sea, but after some testing, found that was not the case. The next most obvious candidate was animals that live in such places—the logical choice for study was migrating birds because of their huge numbers.

The researchers ran some calculations and fed the data into computer models that simulated the Arctic environment both with thousands of tons ammonia emissions into the air and without. They noted first that when guano was broken down by bacteria, ammonia was released, accounting for the rise they observed in their air tests. They also found that when the ammonia mixed with sulfuric acid and water molecules, both from ocean spray, airborne particles were formed that made their way into the atmosphere, contributing to cloud formation. Such low-lying clouds, the team explains, can reflect heat from the sun back into space, leaving the area cooler—the model showed by as much as 1W/m2 during the warmer months.

The researchers are not suggesting that coaxing more birds to migrate to

the Artic each year might slow melting of the ice, but they do suggest their work highlights just how complex our global ecosystem actually is, and how many factors contribute to its current state.

**More information:** B. Croft et al. Contribution of Arctic seabird-colony ammonia to atmospheric particles and cloud-albedo radiative effect, *Nature Communications* (2016). DOI: 10.1038/ncomms13444

**Abstract**

The Arctic region is vulnerable to climate change and able to affect global climate. The summertime Arctic atmosphere is pristine and strongly influenced by natural regional emissions, which have poorly understood climate impacts related to atmospheric particles and clouds. Here we show that ammonia from seabird-colony guano is a key factor contributing to bursts of newly formed particles, which are observed every summer in the near-surface atmosphere at Alert, Nunavut, Canada. Our chemical-transport model simulations indicate that the pan-Arctic seabird-influenced particles can grow by sulfuric acid and organic vapour condensation to diameters sufficiently large to promote pan-Arctic cloud-droplet formation in the clean Arctic summertime. We calculate that the resultant cooling tendencies could be large (about −0.5 W m−2 pan-Arctic-mean cooling), exceeding −1 W m−2 near the largest seabird colonies due to the effects of seabird-influenced particles on cloud albedo. These coupled ecological–chemical processes may be susceptible to Arctic warming and industrialization.