Global warming accelerates uptake of atmospheric mercury in regions experiencing glacier retreat

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As global climate continues to warm, melting of glaciers releases a large quantity of mercury (Hg) originally locked in ice into the atmosphere and downstream ecosystems. Here we show an opposite process that captures atmospheric Hg through glacier-to-vegetation succession. Our study using stable isotope techniques at three succession sites on the Tibetan Plateau reveals that evolving vegetation serves as an active "pump" to take up gaseous elemental mercury (Hg^0) from the atmosphere. The accelerated uptake enriches the Hg pool size in glacier retreated areas by a factor of ~10 compared to the original pool size in the glacier. Through an assessment of Hg source-sink relationship observed in documented glacier retreated areas in the world (seven sites of tundra/steppe succession and five sites of forest succession), we estimate that 400–600 Mg of Hg have been accumulated in glacier retreated areas (5‰ of the global land surface) since the Little Ice Age (~1850). By 2100, an additional ~300 Mg of Hg will be sequestered from the atmosphere in glacier retreated regions globally, which ~3 times the total Hg mass loss by meltwater efflux (~95 Mg) in alpine and subpolar glacier regions. The recapturing of atmospheric Hg by vegetation in glacier retreated areas is not accounted for in current global Hg models. Similar processes are likely to occur in other regions that experience increased vegetation due to climate or land-use changes, which need to be considered when assessing global Hg cycling.