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Atmosphere CO_2 purification method to get the negative emission

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Proposed approach incorporates the possibility of stepwise CO_2 purification in large volumes of the free atmosphere by spraying of alkaline compounds inside natural clouds via an airplane, helicopter or drone. The concentrations of dissociated carbon ions increase in 10 and 100 times accordingly by each unit of pH, so an alkaline reagents significantly increase the solubility of CO_2 in water. Modified rain droplets become saturated by atmospheric CO_2 during their gravitational fall. Calculations show that the pH increase in liquid water content in clouds up to 10 - 11 can provides the transport of carbon mass more then to 40 Gt. The result is that the method can compensate for annual carbon emission by application at 0.07 % – 2 % of our planet surface, the smaller KOH mass, 10 Mt, is needed. The rainy droplets provide the transport of carbon from the atmosphere to the ground and further more to soil, ground water and plants as a result. A potential benefit for green plants was investigated in indoor experiments; plants photos will be presented.

Analysis and calculations highlight a number of method advantages. We show a considerable increase of the gas/water interface to get high CO_2 purification in ensemble of rainy droplets in comparison with flat ocean surface. At the same time, small sizes of rainy droplets provide fast absorption of CO_2 during droplets gravitation fall to satisfy to initial alkaline reserves. Received carbon mass in the rain was calculated using standard models with Marshall-Palmer approximation. The alkali injection process should provide optimal dispersing of reagent, and rainy droplets should have almost uniform pH-level with planned value. The change in the drops spectrum and their pH interval are analyzed after the addition of alkaline homogeneous particles into natural Cu cloud. Turbulent flow of the cloud medium was considered by superposition of vortices of different spatial scales, therefore the medium is determined by the spatial spectral density of the velocity field of the medium flows. The cloud spectrum results by condensation growth of the powder particles surface due to evaporation of native cloud droplets and droplets coalescence in the turbulent flow, so rainy droplets get their pH levels to absorb CO_2 effectively.

Methods for realization of the injection of alkali reagents inside natural clouds were analyzed to be presented at report. The standard injection of powder into the regions of atmospheric upstream fluxes near the cloud base under cloud was analyzed to get average pH-level for rain according to previous calculations. The second method will be proposed by injection of the special small containers with KOH aerosol delivered by flying airplane above cloud.

References

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