



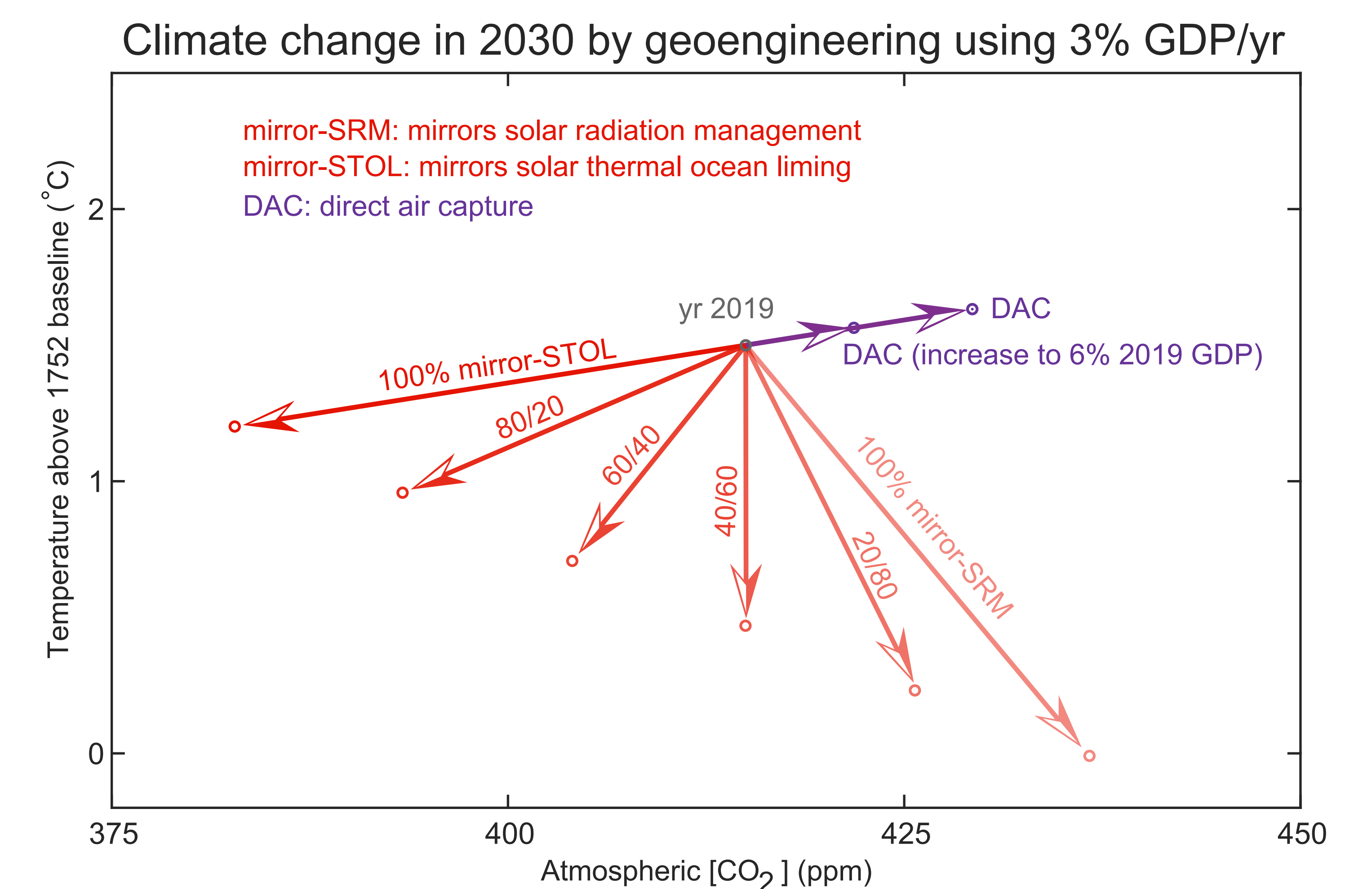
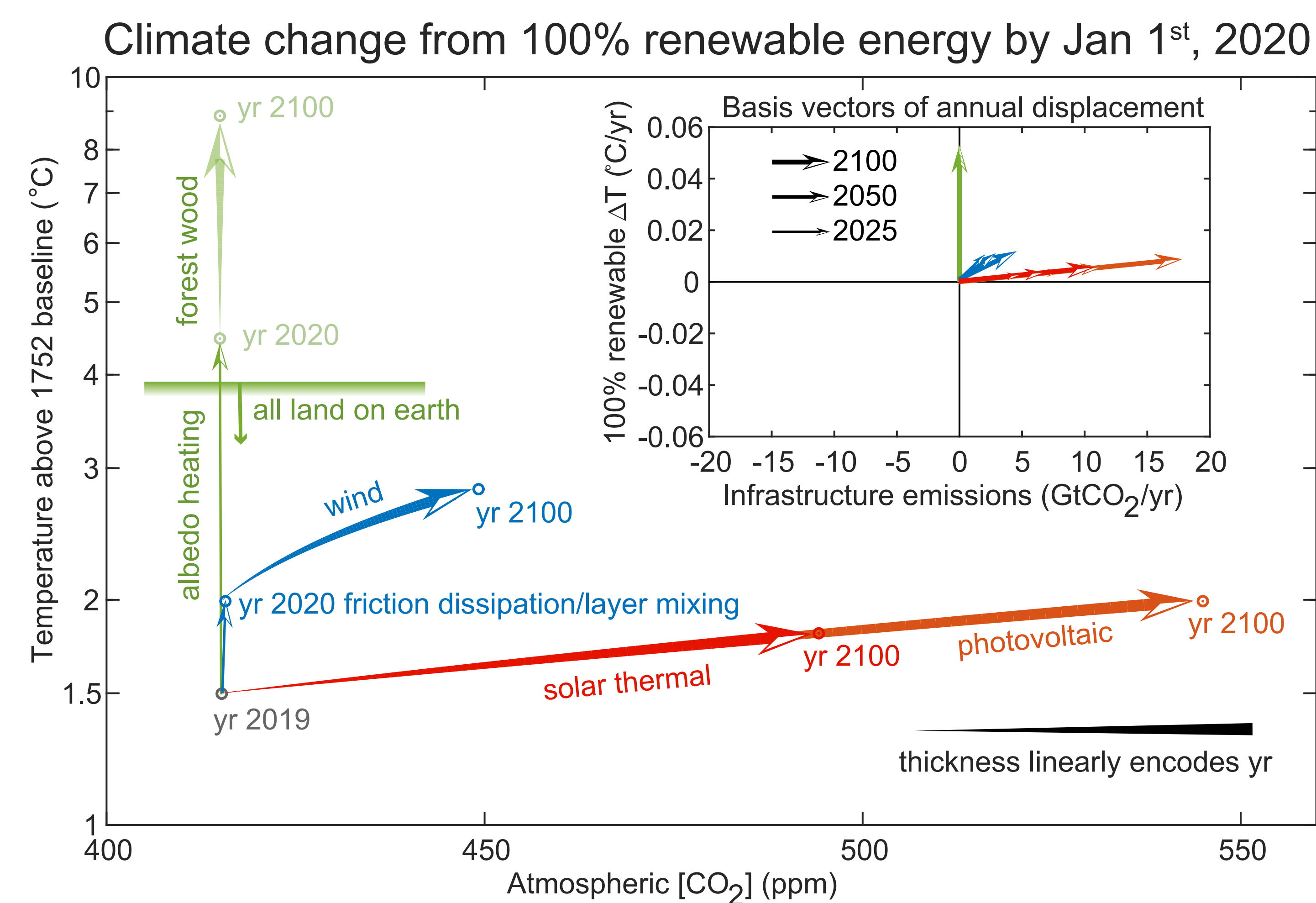
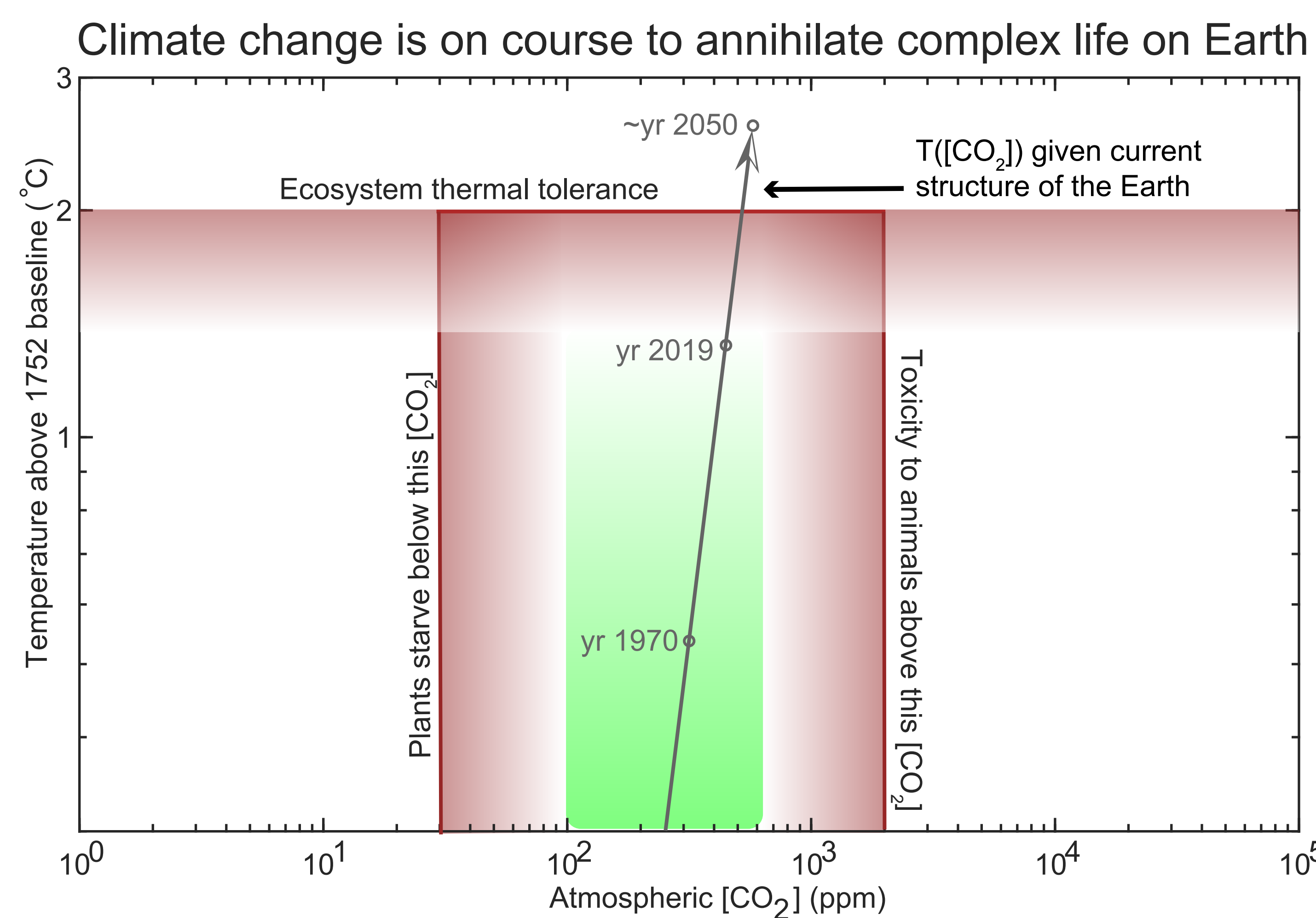
# Mirrors for Earth's Energy Rebalancing (MEER:RefIEction): Resource-driven engineering leveraging Earth's chemistries to immediately offer remediation

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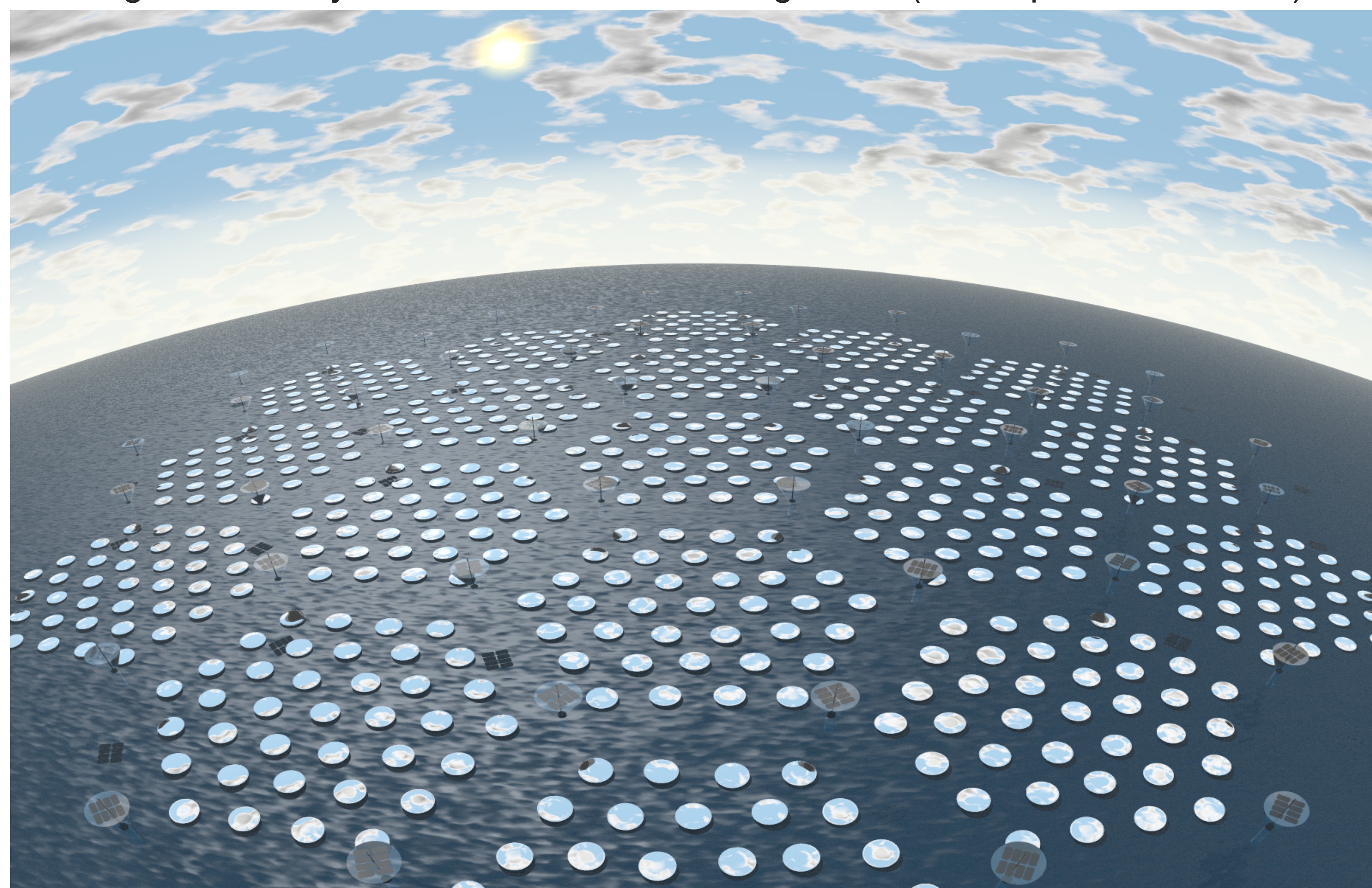
Immediately ending carbon dioxide ( $\text{CO}_2$ ) emissions will not be enough to solve the climate crisis; we also need to stabilize the Earth's temperature by compensating the loss of albedo from short-lived anthropogenic aerosols. Effectively addressing the complex issue requires simultaneously solving three individually challenging problems: (1) planetary overheating, (2) energy production, and (3) ocean acidification. MEER:RefIEction is a grand, versatile, and feasible approach to addressing the imminent urgency of climate change due to temperature increase and ocean acidification while reshaping our energy production and consumption to renewable energy. MEER:RefIEction applies aluminum-coated glass mirror arrays for (1) solar radiation management for albedo control, (2) renewable energy production, and (3) carbon dioxide drawdown through ocean liming using solar thermally produced calcium oxide (CaO). We find full deployment on land and at sea within 10 years both necessary and affordable.

### Key realization:

No individual or combinations of existing renewable energy technologies can return the Earth system to a habitable region in the temperature- $[\text{CO}_2]$  diagram. This is because a 'basis vector' providing system mobility in the  $-\text{CO}_2$  and  $-\text{T}$  directions is currently lacking. Herein, we propose a new geoengineering methodology to save the global ecosystem.



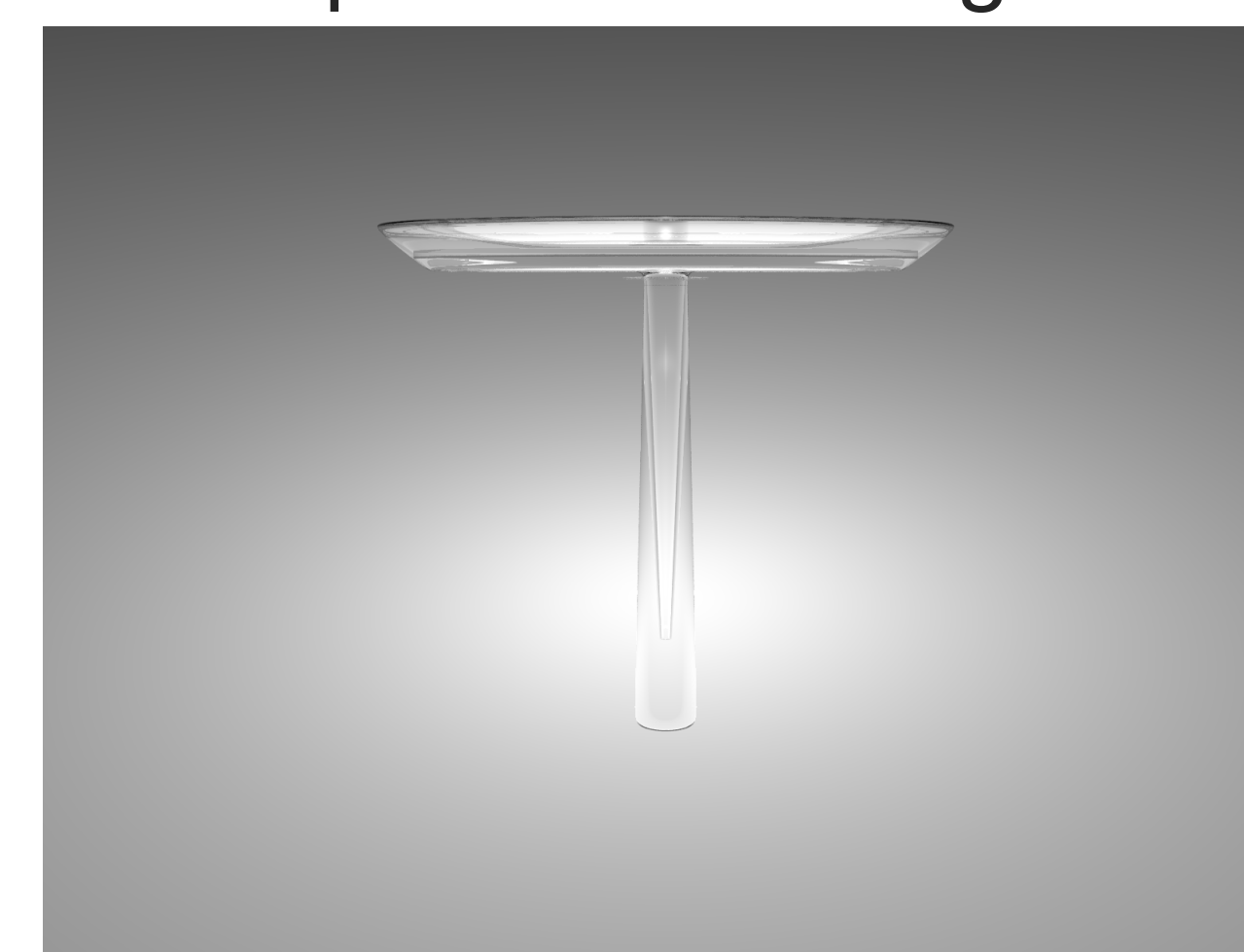
Floating mirror arrays for solar radiation management (Conceptual illustration)



Operating configuration



Storm-protection configuration



MEER:RefIEction effectively manages the albedo effect, contributes to renewable energy production, reduces  $\text{CO}_2$ , while also being:

- (1) Locally testable
- (2) Scalable
- (3) Durable
- (4) Cost effective
- (5) Dynamically tunable
- (6) Net-zero emission and toxicity-free
- (7) Conducive to ecosystem restoration

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Bibliography: Extensive lists of references available upon request at: [tao@rowland.harvard.edu](mailto:tao@rowland.harvard.edu)