

Global Temperature Evolution

Thermal Dynamics of Mars Post-Dual 60km Polar Impacts

1. The Impact Event (T = 0 to 24 Hours)

Phase: Plasma Firestorm

The kinetic energy from two 60km asteroids (traveling at ~15-20 km/s) is converted instantly into heat. The impact sites reach temperatures exceeding 5,000°C. A global shockwave superheats the thin atmosphere.

- **Global Mean Temp:** ~200°C+ (Transient)
- **Effect:** Instantaneous vaporization of polar caps and sterilization of impact zones.

2. The Impact Winter (T = 1 Week to 3 Years)

Phase: Aerosol Cooling

Billions of tons of pulverized rock (silicates) and sulfate aerosols are injected into the stratosphere. This creates a

global dust veil that reflects incoming solar radiation back into space.

- **Global Mean Temp:** -100°C to -120°C
- **Effect:** Despite the new thicker atmosphere, the surface enters a deep freeze as sunlight fails to penetrate the dust.

3. The Greenhouse Awakening (T = 5 to 50 Years)

Phase: Volatile-Driven Warming

As the heavy dust settles, the sunlight reaches a surface now blanketed by a much thicker atmosphere composed of released CO₂ and H₂O vapor. The Greenhouse Effect takes hold aggressively.

- **Global Mean Temp:** -40°C to -20°C
- **Effect:** Rapid warming. Liquid water becomes stable at the equator. Seasonal melting of newly formed permafrost.

4. Long-term Equilibrium (T = 100+ Years)

Timeframe	Mean Temperature	Climate State
Pre-Impact	-63°C	Hyper-Arid / Frozen

Timeframe	Mean Temperature	Climate State
T + 1 Year	-100°C	Impact Winter
T + 20 Years	-30°C	Initial Greenhouse
T + 100 Years	-10°C to 0°C	Temperate Equilibrium

In this final stage, Mars achieves a "Temperate" state relative to its past. The equator would likely experience daytime highs of +15°C to +20°C, while poles remain frozen but thinned. This climate is sustained by the increased atmospheric mass providing better heat retention.