

Giant Impacts

- Impacts long ago in the Solar System?
- Recent impacts?
- Likelihood of a life-threatening impact with Earth?
- What would happen?

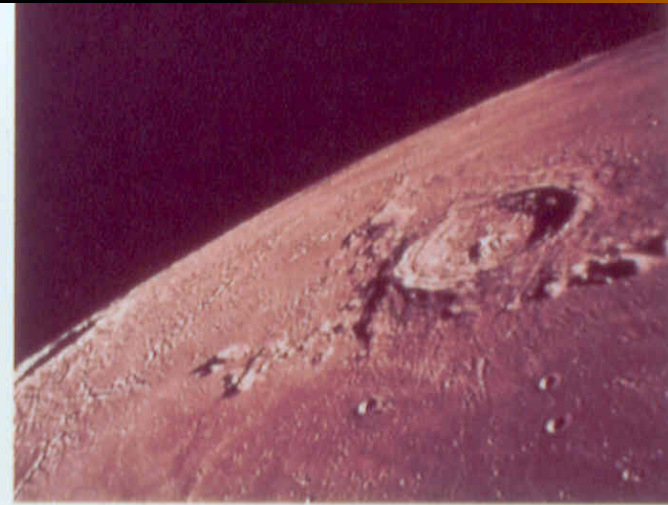


What happens when chunks of rock or ice hit planets?

EVIDENCE FOR IMPACTS: CRATERS

- Craters plentiful on many solid surfaces throughout SS

Earth



Moon

Venus

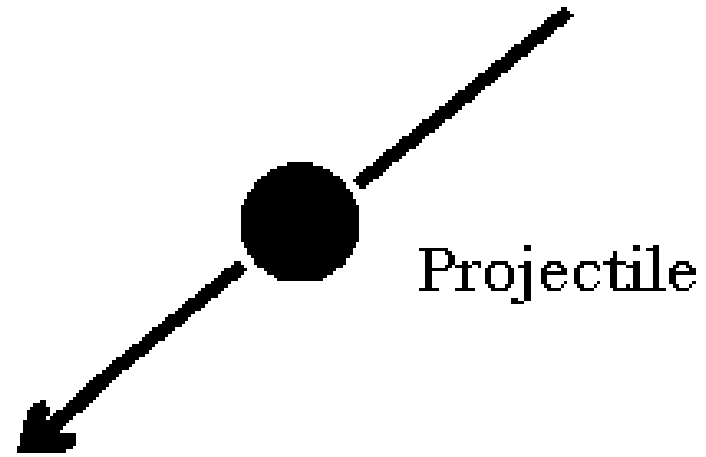


Moon
of
Saturn

CRATERS (ctd)



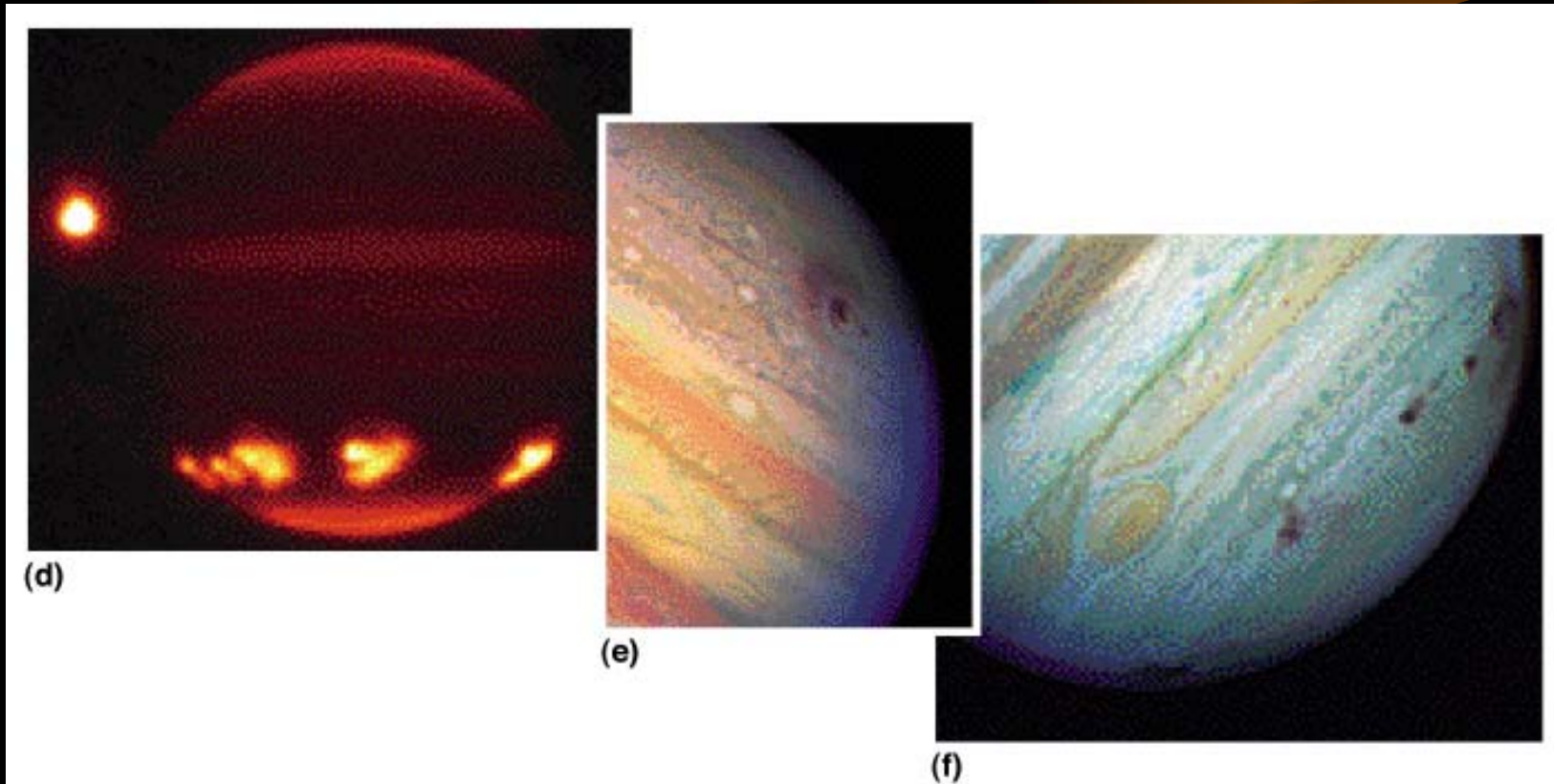
Surface



Projectile

Recent Impacts: 1994

- Comet hit Jupiter



Impacts still occur in the present!!

GIANT IMPACTS ON EARTH: “RECENT” and FUTURE

- Could Earth be hit by a comet or asteroid?
- Craters **do** exist on Earth
- Arizona: 50,000 yr-old, ~1-mile wide crater from asteroid ~1/2 size of football field



Meteor Crater: Arizona

IMPACT BASICS

- Craters much bigger than impact object
- Barringer (Arizona) crater (~1 mile wide) produced by 50-ton or 50-m rock



OTHER EARTH CRATERS



New Quebec



Manicouagan

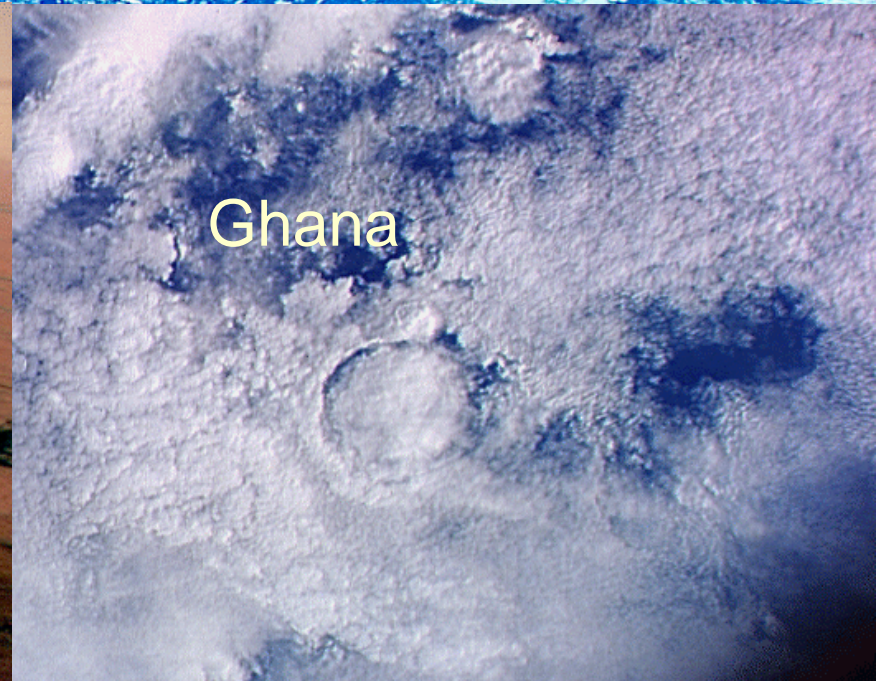


Shatter
Cone from
Haughton
Crater



Wolfe Creek

OTHER EARTH CRATERS (2)



Encounters in Human History

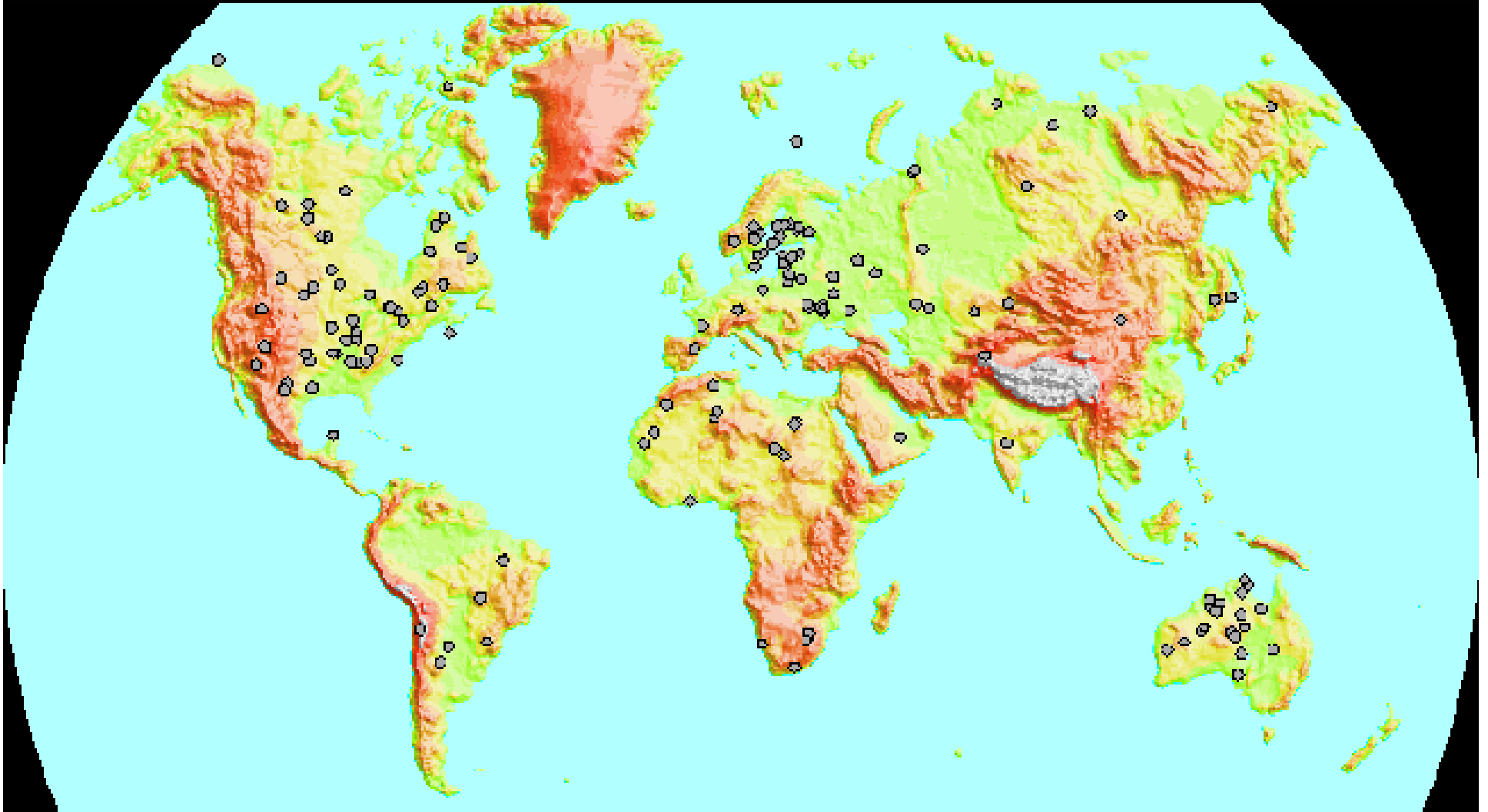
- Atmosphere protects us some, but
 - even objects ~1m in size can reach the ground
 - *Meteorite damages building every few years*
- October 9, 1992:
 - Meteorite smashed through rear end of car in Peekskill, NY
 - No one hurt, but Chevy Malibu not as lucky
 - [Peekskill fireball](#)
- Odds of being hit during your lifetime:
 - Without protection, crude calculation gives odds of ~ 1 in 1 billion

Tunguska, Siberia, 1908:

- 50-m object caused a huge explosion in the atmosphere
- 2000 square km of flat trees
- Even 8km from ground zero trees flattened



Map of Earth Craters



- *Expect one crater > 50 km in size every ~10 million years!*
- *Expect one dino-killing impact every ~ 100 million years!*

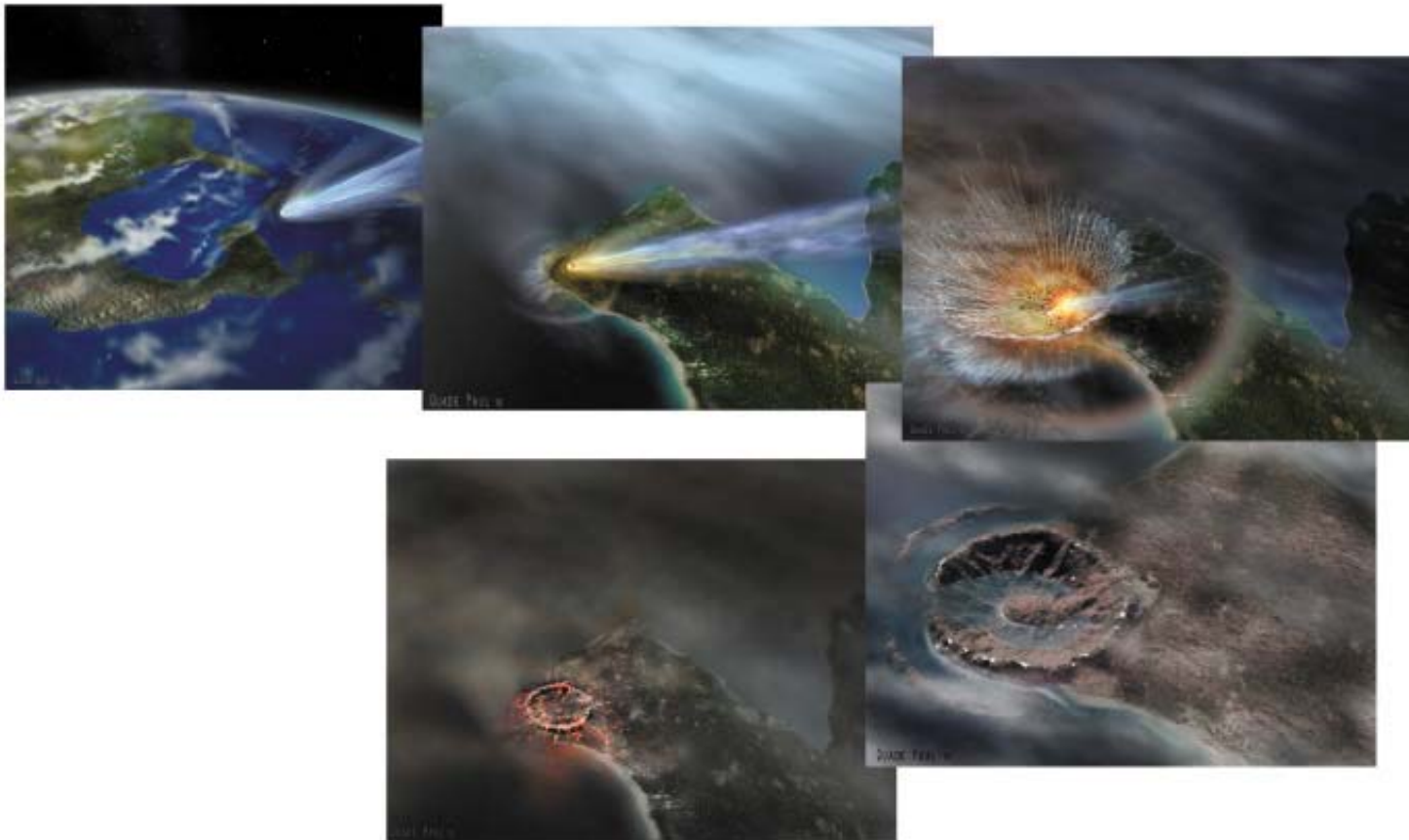
IMPACTS: Consequences

<http://janus.astro.umd.edu/astro/impact/>

- 0.2-1km asteroid (bigger than Arizona crater maker):
 - Broil creatures within eyesight of atmospheric fireball
 - Fiery debris blasted into space, plummets back to Earth triggering huge fires
 - Skies darkened by soot/dust → block sunlight
 - Formation of poisonous gases
 - Huge earthquakes
 - If hits water instead, raise 35-km high splash in 40 seconds; tsunamis over area size of Pacific Ocean

Impacts and Dinosaur Extinction on Earth

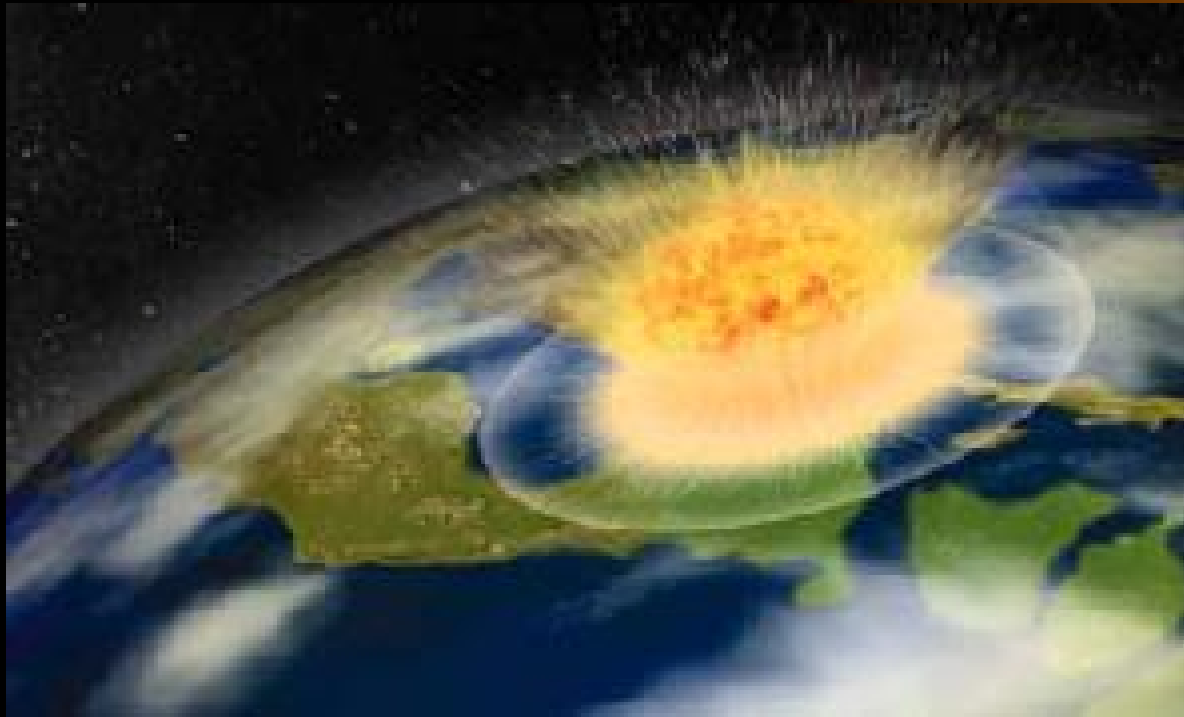
- How does giant impact lead to death of the dinos?
 - debris in atmosphere blocks sunlight; plants die...animals starve
 - poisonous gases form in atmosphere



Want to know more about impact effects?

- Another simulator at

<http://www.lpl.arizona.edu/impacteffects>



- Examples at

<http://www.ece.arizona.edu/~rmarcus/examples.html>