36. Near-Earth Objects
Comets and Meteor Showers

Comets shed dust and debris which slowly spread out as they move along the comet’s orbit.

If the Earth encounters one of these trails, we get a meteor shower.
Perseid Meteor Shower
Major Meteor Showers
Chelyabinsk Meteor: 2013

~0.5 megaton airburst

~1500 people injured
Tunguska Meteor: 1908
Asteroid or comet: $D \sim 40$ m
~10 megaton airburst
~40 km destruction radius
Barringer Crater: ~50 ky BP

M-type asteroid: $D \sim 50$ m

~10 megaton impact

1.2 km crater diameter
Chicxulub Crater: ~65 My BP

Asteroid: $D \sim 10$ km

180 km crater diameter
Near-Earth Asteroid Discoveries

All Asteroids

- LINEAR
- NEAT
- Spacewatch
- LONEOS
- Catalina
- Pan-STARRS
- NEOWISE
- all others

Near-Earth Asteroid Discoveries

Large Asteroids (kilometer sized and larger)

- LINEAR
- NEAT
- Spacewatch
- LONEOS
- Catalina
- Pan-STARRS
- NEOWISE
- all others

Half Year Intervals

Number Discovered

12 January 2015
Alan B. Chamberlin (JPL)
Known Potentially-Hazardous Objects
Origin of Near-Earth Objects (NEOs)

Some fragments wind up on orbits which are resonant with Jupiter.

Their orbits grow more elliptical, finally entering the inner solar system.
Asteroid Families

Many asteroids are members of families; they have similar orbits and compositions (indicated by colors).

Inner belt asteroids (left) and families (right).
Chicxulub Impactor: Speculative History

1. Baptistina parent body (170 km diameter) smashed \(\sim 160\) Myr ago.

2. Fragment hits Moon, forming Tycho crater (110 Myr ago).

3. Fragment hits Earth, forming Chixulub (65 Myr ago).