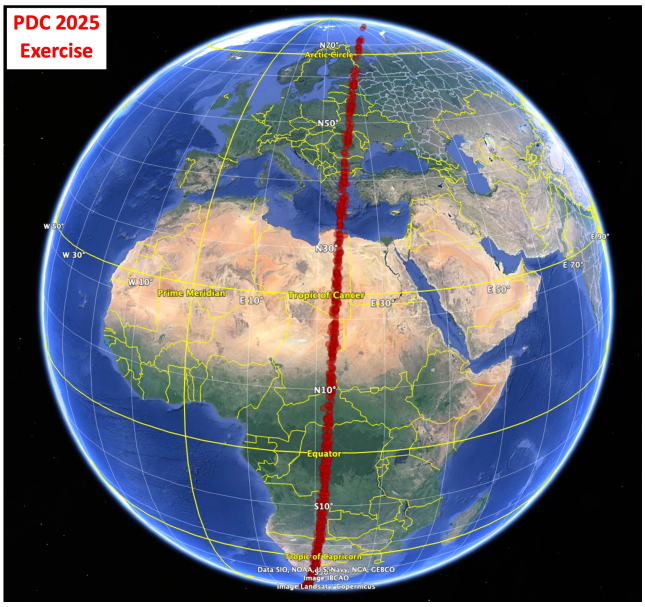


Planetary Defense: How to Prepare for an Asteroid Impact on Earth

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In the context of increasing attention to planetary risks, one of the most fascinating and at the same time alarming scenarios is that of an asteroid impact. The **Planetary Defense Conference**, held in **Cape Town** from May 5 to 9, 2025, focused on planetary defense exercises, simulating the possible impact of an asteroid **150 meters in diameter**. This exercise allowed experts to explore techniques, strategies, and international responses to defend Earth from a potential catastrophe.

The Case of Asteroid 2024 PDC25

During the exercise, a hypothetical asteroid, identified as **2024 PDC25**, was discovered by the Catalina Sky Survey on June 5, 2024. Initially, the probability of an impact with Earth was very low, but as observations increased, the probability grew, reaching 1.6% by July of the same year. The simulation showed how an impact threat can evolve and how periodic observations are crucial to reduce uncertainties.

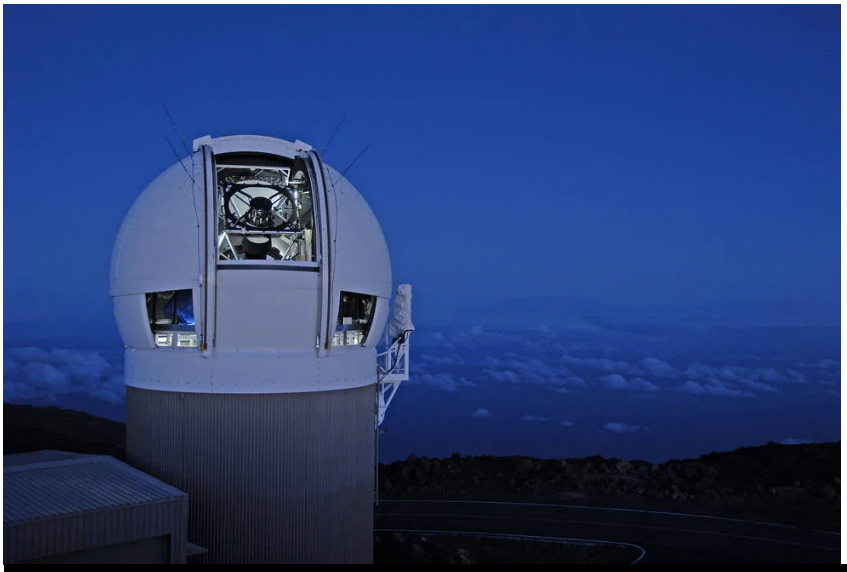
If the asteroid had been truly detected as a danger, the **Minor Planet Center** would have provided the necessary information for assessment by world governments. This exercise highlighted how international collaboration, such as that between **NASA**, **ESA**, and the International Asteroid Warning Network (IAWN), is essential for planetary defense.



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The Threat of a 150-Meter Asteroid

In the specific case of an asteroid with a diameter of 150 meters, the implications would be devastating. The impact energy, which could range between **45 and 160 megatons**, is equivalent to that of thousands of atomic bombs. For comparison, the most well-known impact in recent history, the **Tunguska event**, released about **10-15 megatons** of energy. The simulation revealed that if the asteroid had fallen on a densely populated area, such as the corridor crossing **Eastern Europe** and the **Mediterranean Sea**, the impact would have caused millions of casualties and catastrophic damage within a 100-120 km radius.



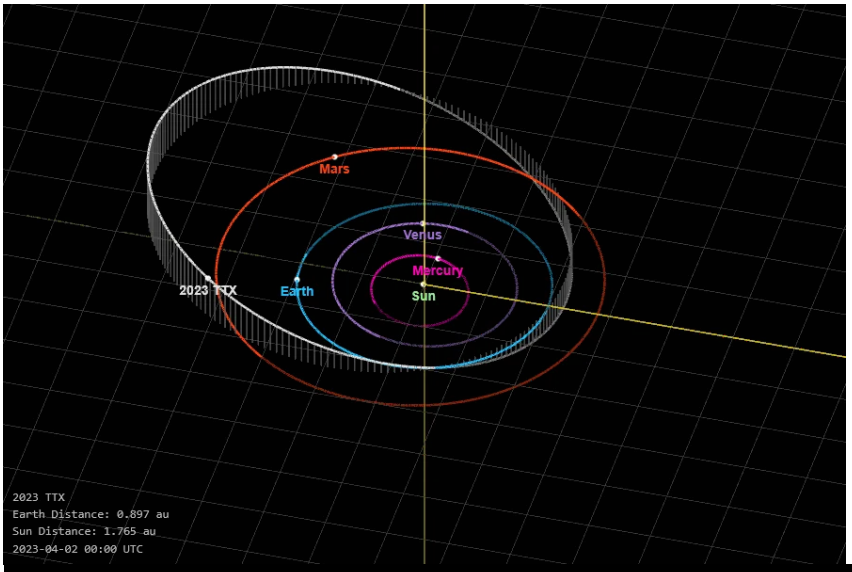
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Defense Techniques: What to Do?

The simulations explored various solutions to deflect an asteroid on a collision course with Earth. Three main options were analyzed:

1. **Kinetic Impactor**: A device that strikes the asteroid to change its orbit. This technique was successfully tested by the NASA's DART mission, but in the case of larger asteroids, multiple missions might be necessary.
2. **Nuclear Explosive Devices**: This technique involves using a nuclear detonation near the asteroid to alter its orbit by exploiting the rocket effect caused by the vaporization of the asteroid's surface. It is an option not yet tested but seriously discussed.
3. **Ion Beam Deflection**: Using ion beams to move the asteroid. Although promising, this technique has not yet been tested in the field.

The simulation also examined the case of a smaller asteroid, less than **40 meters**, for which it would have been preferable to evacuate the impact area rather than attempt a deflection.

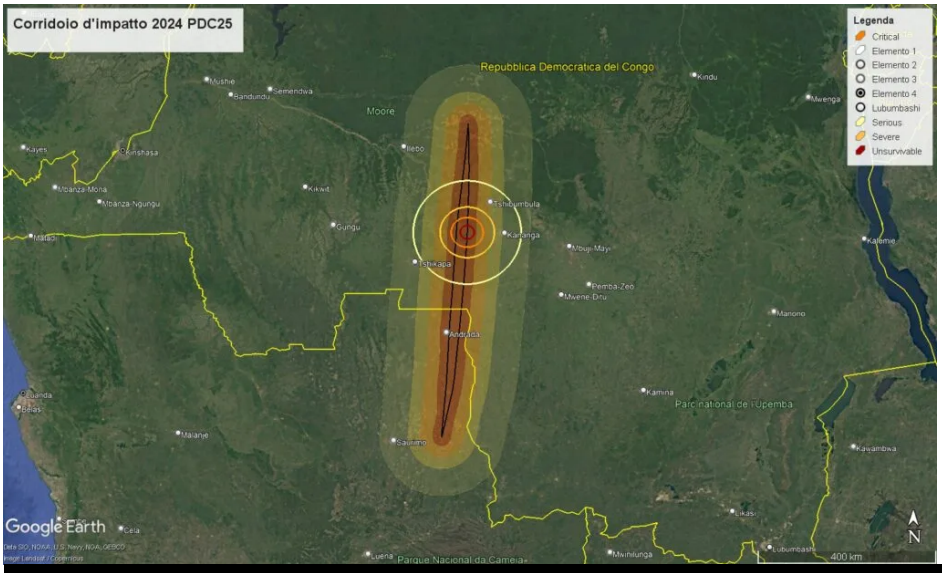


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Possible Consequences of an Impact

Even if the planetary defense mission was successful in terms of simulation, the hypothetical case of an impact on land in a densely populated area would have had severe consequences. In addition to direct damage, a **meteotsunami**, a type of tsunami caused by sudden atmospheric pressure, would have been generated, with waves up to **10 meters** high hitting the coasts of **Antarctica**, **Africa**, and **South America**.

In any impact scenario, the catastrophe would have involved hundreds of thousands of people, with casualties ranging from several thousand to over a million, depending on the exact location of the impact.



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Conclusions

The planetary defense exercise highlighted the importance of a global action plan to address the threat of asteroids. Although the simulated case of 2024 PDC25 did not pose an immediate danger, the risk of an asteroid hitting Earth is far from negligible.

Science and technology are making enormous progress in planetary defense, but history reminds us that a catastrophe of this magnitude could have devastating consequences. **Asteroids** were the main cause of the extinction of the **dinosaurs**, about 66 million years ago, when a devastating impact caused radical climate changes and the destruction of much of life on Earth. Despite millions of years of evolution, that cataclysmic event demonstrated how vulnerable we can be to the forces of nature coming from space. Preparing for such a threat, with advanced strategies and international cooperation, is essential to ensure our survival and that of our planet.

News link: https://cneos.jpl.nasa.gov/pd/cs/pdc25/