Key words: Near Earth Objects, NEO, asteroid, comet

ESOcast Episode 168: NEOs — Near Earth Objects	
00:00 **[Visual starts]** **ESOcast intro** 1. New ESOcast introduction Text slate: Episode 168 // NEOs — Near Earth Objects	**00:00** ESOcast introduction
00:12 2. Text Slate: What is a NEO? Statement Olivier Hainaut, ESO astronomer: Near Earth Objects are really just that. These are celestial objects that come near to the Earth and there are broadly two classes: Near Earth Asteroids and Comets.	
00:29 3. Text Slate: Where do these objects come from? Statement Olivier Hainaut: The Near Earth Asteroids, they mostly come from the asteroid main belt which is between Mars and Jupiter and it can happen that because of a collision or because of an interaction with one of the planets, one of them falls down from its orbit in the main belt to an orbit that brings it closer to the Sun and therefore closer to the Earth.	

00:57 4. Text Slate: How many NEOs are there? Statement Olivier Hainaut: The Near Earth Objects, there are a few big ones, there are many more small ones and there are many many more very small ones. We know most of the big ones, big is one kilometre or more. For those that are 100 metres we know about 10 percent. For those that are 10 metres we know less than one percent of them. So that's annoying, because an object that is 10 metres in diameter, on impact with the Earth, would release about the same energy as a Hiroshima bomb. We are trying to characterise everything that is bigger than 20 or 50 or 100 metres where we are at 10 percent now, so we still need to find 90 percent. In terms of numbers, we know 10, 20 thousand of them and we are still missing 90 percent so there is a lot of work to find them and to track them.	
02:06 5. Text Slate: How can we search for them? Statement Olivier Hainaut: To discover Near Earth Objects, you need a super wide-angle telescope and then you just scan the whole sky night after night in order to see everything that is moving. The asteroids are moving, and so we have computer programmes that will find them, measure their position and from this position we can extrapolate the orbit and we refine the orbit until we have an orbit that is good enough that we will not lose the asteroid again.	

02:41 6. Text Slate: How often do impacts on Earth occur? Statement Olivier Hainaut: We know from history, and also looking at the Moon that there are many impacts. On average a small one, which is like a few tens of metres, that happens every few years. Bigger ones are fortunately less frequent because there are fewer of these objects. Very big ones are even less frequent because there are very very few of them. So if you take a very big one, a 15 or 20 kilometre asteroid, hitting the Earth, last one was 65 million years ago. That was bad for the dinosaurs, and historically we see this kind of giant impact every 50 million years or so.	
03:31 7. Text slate: What we can do to predict impacts and what role does ESO's Very Large Telescope pay? Statement Olivier Hainaut: To predict an impact with a Near Earth Asteroid, a Near Earth Object, you need to know its orbit very precisely. And so to do that you need to measure the position of the object on the sky over and over and over. It's difficult because many of these objects are small and they are not always near the Earth. They can be on the other side of the Solar System. The combination of their size and their distance makes them extremely faint which means that most of the time the telescope that discovered them, which is a 2-metre class telescope, can observe them only for a few days and then they cannot see them anymore because they become too faint. That's where the VLT, the 8-metre, big telescope, comes into play because with the collecting power of the huge mirror we can see much fainter asteroids.	

04:32 8. Text slate: What is the VLT in particular used for? Statement Olivier Hainaut: Using the VLT, we refine the orbit of the Near Earth Object, the threatening ones that could have a collision, in order to make sure that the orbit is known well enough either to rule out a collision, that's ideal, or to characterise a collision.	
04:57 9. Text slate: Is there anything we can do to prevent NEO impacts? Statement Olivier Hainaut: To protect ourselves from a Near Earth Object, we must know them, and prepare in advance before a collision. So if we have enough time, 20 years or so, we can send a rocket and do something to the asteroid. That can be nuke it; you know — atomic bomb — either to try to destroy it or to push it. There are some more gentle ways. A cute way to do it is to spray paint the asteroid with bright white paint because that will change the way it reflects the sunlight and that can be sufficient to push it away from its orbit. Or you could also land a small rocket on the asteroid and let this small rocket push it. Or if it's a very small asteroid you can go cast a net and grab it and pull it away.	
05:55 [Outro]	*Produced by ESO, the European Southern Observatory.* *Reaching new heights in Astronomy.*