

Lunar Views: A Tale of Three Craters

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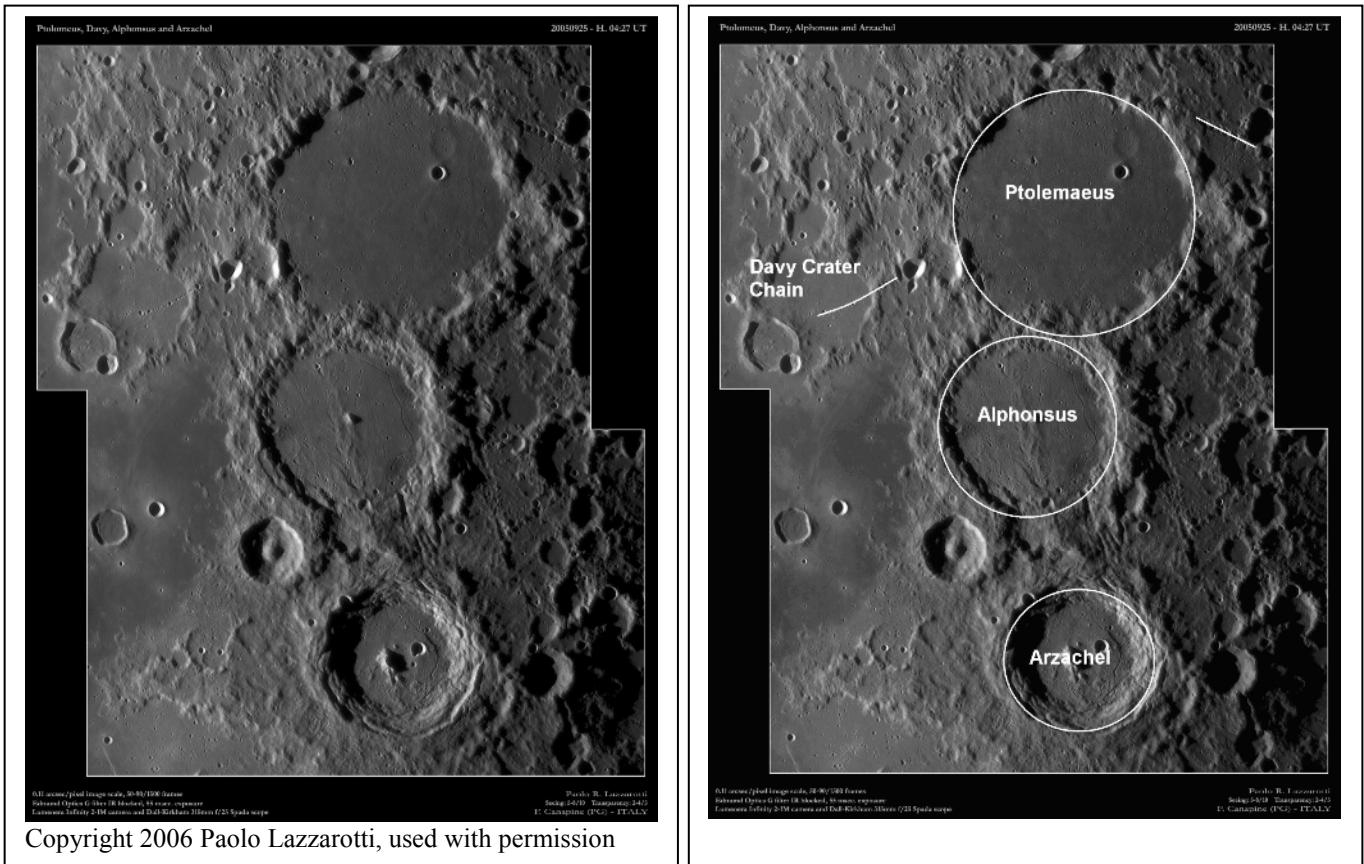
On Earth, one technique used to judge the age of geological formations is to note the effects that erosion has had on the structure. For example, we know that the Appalachian Mountains in the eastern US are much older than the Rocky Mountains in the central US. Primarily through the forces of water and ice over millions of years, the Appalachians have been reduced to very large, rounded hills. These forces are at work on the Rockies as well, but have not yet had enough time to rub down their grand, jagged peaks. Even though the erosive forces on the earth and on the moon are different, this technique can still be used to judge the age of a formation.

One of the best places to see several craters of similar size but different age located side-by-side is the Ptolemaeus-Alphonsus-Arzachel region. These are three large craters located close together almost right in the center of the face of the moon. The best time to view them is just past first-quarter or just before third-quarter.

Below is a photo of this region taken by Paolo Lazzarotti. Paolo lives in Italy and has taken an enormous number of very beautiful lunar photographs that he regularly shares on Astromart and posts on his website: <http://www.paololazzarotti.com>. I thank him for giving me permission to use his photo here. If you would like to see this photo in its original resolution, you can find it at:

http://www.paololazzarotti.com/cielo/quartet20050925_0427_lazz.jpg

As you look at the photo, the differences in the craters are very obvious. Ptolemaeus has a broad flat floor with no central peak, and the rim of the crater is almost missing in some places. Alphonsus also has a flat floor, but the central peak is still there, and the walls of the crater are more rugged and show signs of terracing. Then there is Arzachel, a fine example of a complex crater in all its glory, terraced walls, distinct central peak, and a mantle of ejecta outside of the crater walls.



At this point, it is now probably apparent to you what the relative ages of the craters are.

Ptolemaeus is the oldest, Alphonsus the middle brother, and Arzachel the youngest. All three are craters of the complex class (crater classes were discussed in a previous edition of Lunar Views). However, what happened to the central peak of Ptolemaeus? The answer to this question, and the fact that its floor is so flat are related. After an impactor struck the moon and formed Ptolemaeus, magma from below the crust of the moon rose up through the cracks that the impact had formed in the crust. Being a very liquid form of magma, it pooled and then hardened in the crater to form the flat floor. Enough magma filled the crater to completely submerge and hide the central peak, but not quite enough to spill over the crater walls and out into the surrounding countryside.

The flat floor of Alphonsus is also an indicator that magma flooded the crater from below. In this case, there was not enough to obliterate the central peak though.

Further battering by many smaller impactors over the eons has helped to smooth out the rough edges of Ptolemaeus and Alphonsus, but the beautifully terraced inner walls of Arzachel remain almost untouched because of its young age.

Another sign of the temporal sequence of events that has taken place on the moon can be seen in these three craters. Notice that each of them has smaller craters formed within their crater walls. Obviously these smaller craters were formed after their bigger hosts.

While we're in the area, there are a few other interesting features to note. I'll cover some of these in future editions of Lunar Views, for now let's admire their beauty and ponder their origin. The first is the Davy Crater chain, named after Crater Davy that it points toward at the left. I also noticed another crater chain in the upper right of Paolo's photo. I could find no name or mention of this crater chain in the source I usually seek out.

Note the rather prominent crater in the upper right region of Ptolemaeus, this crater is named Ammonius. Now look just above Ammonius and you will see a very subtle circle slightly larger than Ammonius. This is a feature referred to as a ghost crater, this one is called Ptolemaeus B. These can be very hard to find unless the lighting is just perfect. Paolo has done a great job of capturing this ghost.

Weather permitting, you will have at least two chances to observe this region of the moon under favorable lighting yourself before the next edition of Lunar Views is published. It is a wonderful, feature-rich area to explore.

You are welcome to contact me by email at doug@ShoestringAstronomy.com, and view some of the astronomical fun I have at www.ShoestringAstronomy.com