Table 1
Geographic locations and measurements of the physical attributes of Boola Crater (#1) and 12 high-latitude Pd (#2–13) that have layers exposed along their marginal scarps. Values for Boola Crater were not included in calculating the median, mean, and standard deviation.

Crater #	Latitude (°N)	Longitude (°E)	Height (m)	Crater diameter (km)	Pedestal extent (km)	P/C ratio
1	81.3	−105.2	N/A	17.9	N/A	N/A
2	74.7	107.1	88	2.8	8.1	5.8
3	74.2	78.3	126	4.7	15.7	6.7
4	74.1	67.0	172	2.9	6.7	4.6
5	70.9	93.2	81	3.0	6.6	4.4
6	69.5	74.9	139	2.3	7.2	6.3
7	−66.4	62.0	167	15.3	59.8	7.8
8	−71.3	54.7	102	2.0	3.5	3.5
9	−71.7	55.5	265	14.6	37.1	5.1
10	−72.1	−9.2	434	3.1	5.1	3.3
11	−78.6	−7.5	105	1.5	3.9	5.2
12	−79.2	124.3	173	3.1	4.6	3.0
13	−80.8	86.3	96	5.4	10.8	4.0
Median			132.5	3.1	7.0	4.9
Mean			162.3	5.1	14.1	5.0
Standard deviation			100.0	4.7	17.1	1.5

pedestal surfaces, have mean crater diameters of <2 km, mean pedestal heights of <60 m, and have mean pedestal to crater radius (P/C) ratios of ~3 (Kadish et al., 2009, 2010). The P/C ratio represents the farthest extent of the pedestal as measured from the crater rim crest divided by the crater radius. We have, however, identified a distinct subpopulation of Pd that show visible layering along their marginal scarps (Fig. 1). This layering has not been observed along any pedestal margins equatorward of 65° latitude. Measurements of pedestals that exhibit layering reveal important physical differences compared to those without layers at both mid and high latitudes (Table 1). Most notably, pedestals with exposed layers tend to be taller and larger in lateral extent, and have larger crater diameters. It is important to note that these layers are the armored remnants of paleodeposits, and are morphologically distinct from layered ejecta structures caused by impacts into subsurface volatiles and the subsequent emplacement of ejecta (Barlow, 2004). Although some Pd do exhibit single layer ejecta superposed on the pedestal surface, the pedestal itself is not composed of ejecta as confirmed by the high P/C ratios of Pd and the flatness/smoothness of the pedestal surfaces (e.g. Kadish et al., 2010).

Boola Crater (#1 in Table 1) offers some important observations in regard to the preservation of layers below impact craters. Although Boola does not qualify as a true Pd (Tanaka et al., 2008), it does have a marginal scarp along part of its perimeter that exhibits distinctive layers. Boola does not technically classify as a Pd because half of it is covered by the polar layered deposit, and as such, we have not calculated a value for its pedestal extent or P/C ratio. However, if that part of the deposit were removed, Boola would be a Pd. We thus interpret Boola Crater as a clear example of the transition from atmospherically emplaced polar layers below an impact crater to an evolving Pd where the preserved layered are readily exposed; in other words, Boola Crater offers a rare view of the pedestal-forming process and provides insight into the nature of the ice-rich, layered target material from which Pd can form.

3. Exposed layers along marginal scarps

Our high-latitude survey has identified 12 Pd with visible layers, five in the northern and seven in the southern hemisphere

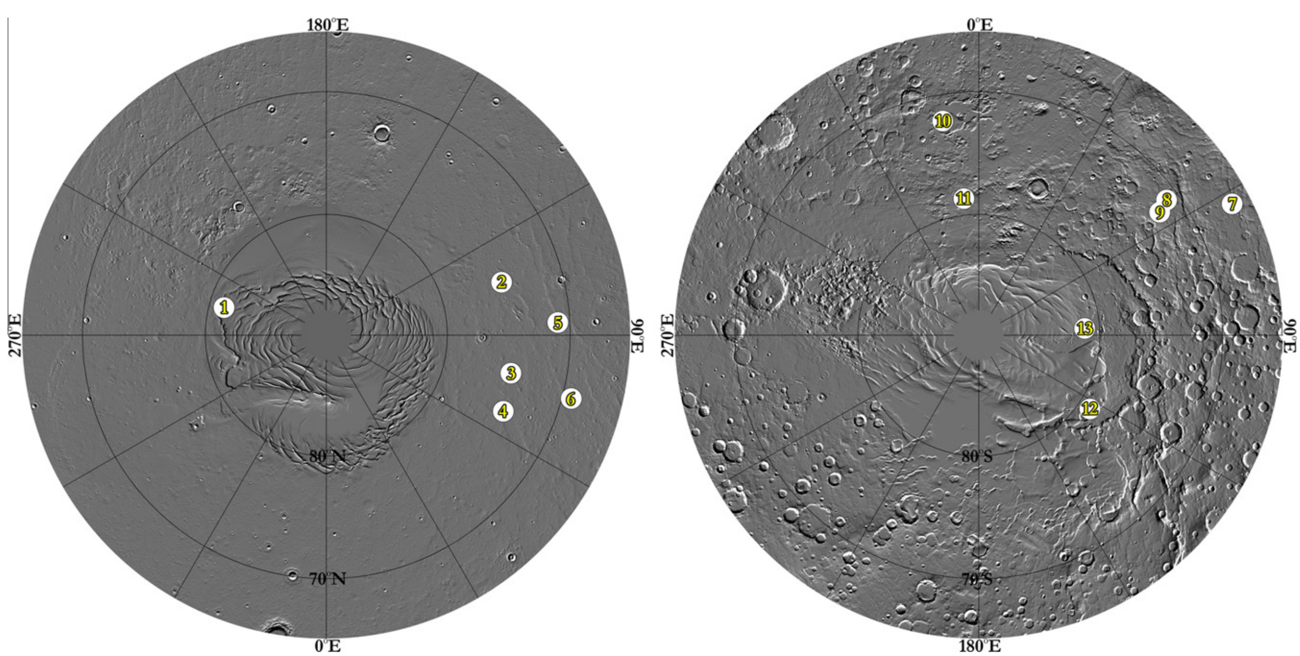

Fig. 2. The distribution of Pd with exposed layers mapped in north (left) and south (right) polar projections. The numbers on the maps correspond to the crater numbers listed in Table 1. Note that the pedestals are primarily located in the eastern hemisphere. In the northern high latitudes, they are clustered just north of Utopia Planitia.