PUREST ANORTHOSITE DISTRIBUTION IN THE LUNAR SOUTH POLE-AITKEN BASIN DERIVED FROM SELENE MULTIBAND IMAGER. K. Uemoto[1, 4], M. Ohtake[1], J. Haruyama[1], T. Matsunaga[2], Y. Yokota[1], T. Morota[1], R. Nakamura[3], S. Yamamoto[2], and T. Iwata[1], [1]Japan Aerospace Exploration Agency, 3-1-1 Yoshinodai, Sagamihara, Kanagawa, 229-8510, Japan (uemoto@planeta.sci.isas.jaxa.jp), [2]National Institute for Environmental Studies, [3]National Institute of Advanced Industrial Science and Technology, [4]The University of Tokyo

Introduction: South Pole-Aitken (SPA) is one of the biggest basins (2500 km in diameter [1]) on the lunar farside. It has been suggested, in previous studies, that the most of the upper crustal material was exchanged and the lower crust or mantle materials are exposed in this basin [e.g., 2]. Particularly, this excavation effects is the most significant at the central part of the basin [1]. However, Pieters et al. [2] reported that there is anorthosite in the small crater in the south of the Alder crater (77 km in diameter). This crater locates within estimated transient cavity of the SPA basin [2]. Additionally, Ohtake et al. [3] reported that the purest anorthosite (>98 vol.% plagioclase) exposed in the Leibnitz crater which located in the northwest of the Alder crater [3] (Figure 1).

If rocks of anorthosite composition present within SPA in many locates, the suggest following possibly; (1) anorthosite was generated by differentiation of the impact melt, (2) anorthosite was remained without being ejected, (3) anorthosite was collapsed down from outside of the transient cavity.

In this study, we analyzed craters within SPA and investigated the distribution of purest anorthosite. Especially, we focused craters at the lower elevation areas of the SPA because these locations supposed to excavate deepest location are within the crust.

Methods: We chose the craters to analyze by selecting higher reflectance locations because the reflectance of anorthosite is higher than the rocks with more mafic rich compositions based on the Clementine 750 nm-base map. The craters we analyzed are Antoniadi, Alder, Bellinsgauzen, Hopmann, Minnaert, Numerov, Lemaitre, Poincare, and Zeeman. They are 15-143 km in diameter (Figure 1 and Table 1).

We used images taken by the SELENE Multiband Imager (MI) to investigate the mineralogy within the craters and their surrounding area in the SPA basin. The reflectance spectra in the standard viewing geometry were calculated by using the photometric function proposed by digital terrain models (DTMs) generated by the MI. MI has both visible and near-infrared coverages with spectral bands at 415, 750, 900, 950, and 1000 nm (VIS sensor) and 1000, 1050, 1250 and 1550 nm (NIR sensor). In all MI images, spatial resolution is adjusted 20 m x 20 m per pixel. At each location, the reflectance is given by averaging an area corresponding to 6 x 6 pixels in the MI VIS to remove spatial variation. We also made the color-composite image (Figure 2a). In this image, red, green and blue are assigned to continuum-removed absorption depths at 950, 1050 and 1250 nm. These approximately indicate the relative strengths of pyroxene, olivine, and plagioclase absorptions, respectively.

We estimated the mineralogy by using absorption band generated by plagioclase (around 1250 nm), olivine (around 1050 nm) and pyroxene (around 1000 nm). Presence of the purest anorthosite is determined by the greatest absorption depth around 1250 nm.

Additionally, we checked and confirmed that the purest anorthosite is exposed at fresh surface by comparing maturity map generated by using an expression of OMAT by Lucey et al. [4].

Results: In the crater of Poincare NE, we found purest anorthosite at south side of the wall (locations of number 1 and 4 in Figures 2 and 3). In the maturity map, locations of purest anorthosite are fresh surfaced areas indicating. Possibility these were generated by collapse in the crater wall.

However, on the crater of Antoniadi, Alder, Bellinsgauzen, Hopmann, Minnaert, Numerov, Lemaitre, Zeeman, there are no evidence of the purest anorthosite from our analyses. In these craters, we recognized only pyroxene or ever anorthosite from reflectance spectra absorption is deepest at 950 nm.

Discussion: From our analyzes, we confirmed that the anorthosite rocks present within the transient cavity and its composition is very high plasioclase abundance. Presence of anorthosite within transient cavity of SPA possibly suggests that well beyond collapse of anorthosite from outside of the transient cavity is unlikely among three scenarios.

References: [1] Spudis P.D. et al. (1994) *Science*, 266, 1848-1851. [2] Pieters C.M. et al. (2001) *JGR*, 106, 28,001-28,022. [3] Ohtake M. et al. (2009) *Nature*, 461, 236-401. [4] Lucey P. et al. (2000) *JGR*, 105, 20, 377-20, 386. [5] Hiesinger H. and Head J.W. (2004) *LPSC XXXV*, Abstract #1164.

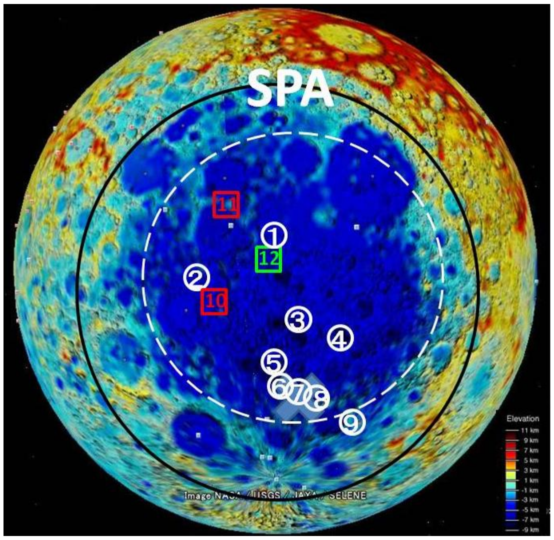

Figure 1. Distribution of the craters we analyzed in this study. Elevation map is from *www.google.com/moon/*. Large brack circle is the rim of SPA from Spudis et al. [1]. White dotted line circle is the transient crater by Hiesinger et al. [5]. Numbers of each location correspond to the crater numbers in Table 1. Red squares indicate locations the purest anorthosite (>98 vol.% plagioclace) was found. White circles are designated places where no purest anorthosite was found. A green square indicates the place where anorthosite was reported in prerious study [2].

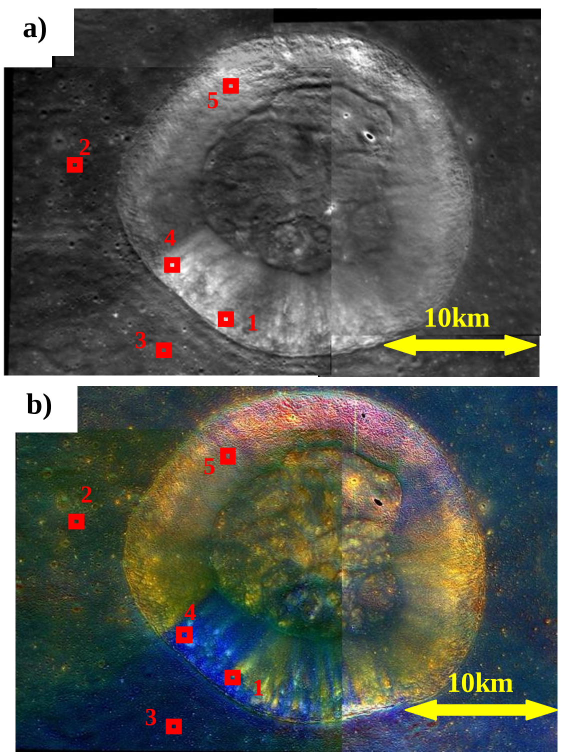

Figure 2. a) Multiband Imager 750 nm image of Poincare NE. b) A color-composite image of Poincare NE. Red, green, and blue are assigned to continuum-removed absorption depths at 950, 1050, and 1250 nm. These approximately indicate the relative strengths of pyroxene, olivine, and plagioclase absorptions, respectively. Reflectance spectra of red squares is presented in Fig. 3. Squares 1 and 4 indicate locates purest anorthosite was found. Squares 2, 3, and 5 indicate locations it was not found.

	Name	Lati-tude	Longitude	Diameter (km)	Purest Anor-thosite
1	AlderN	47S	179E	15	No
2	Hopmann	51S	160E	88	No
3	Bellinsgau-zen	61S	164W	20	No
4	LemaitleW	62S	155W	8	No
5	MinnaertNE	65S	175W	20	No
6	Antoniadi	70S	168W	143	No
7	NumerovC	71S	163W	113	No
8	NumerovE	71S	154W	40	No
9	ZeemanN	72S	138W	30	No
10	PoincareNE	54S	161E	20	Yes
11	(Leibnitz)	38S	179E	245	Yes
12	(Alder)	47S	178W	77	(Yes)*

Table.1 The list of the craters we analized
*The result of Alder (12) is not purest anorthosite but simply 'anorthosite' because of the data from Clementine.

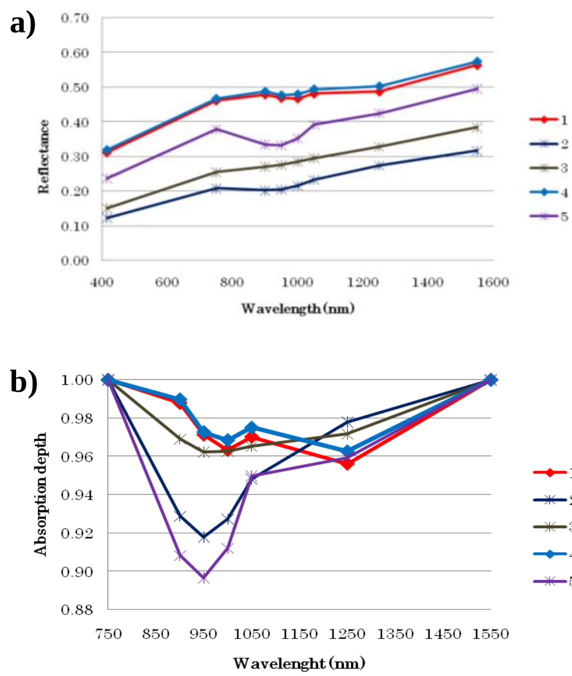

Figure 3. Reflectance spectrum of each location in North crater of the PoincareNE. a) shows representative reflectance spectra of PoincaeNE crater. b) shows absorption after continuum removal spectra, Number 1 and 4 indicate largest absorption about 1250 nm indicating purest anorthosite composition. Graphs of red (1) and blue (4) in both profiles indicate that the purest anorthosite is present. Other color graphs (2, 3, and 5) indicate that it is not present. At each location, the reflectance is given by averaging an area corresponding to 6 x 6 pixels in the MI VIS to remove spatial variation.