YAMATO 983885: A NEW LUNAR METEORITE FOUND IN ANTARCTICA. H. Kaiden and H. Kojima, Antarctic Meteorite Research Center, National Institute of Polar Research, 1-9-10 Kaga, Itabashi-ku, Tokyo 173-8515, Japan (kaiden@nipr.ac.jp).

Introduction: More than 4100 meteorites were found around the Yamato Mountains and Belgica Mountains, Antarctica in the 1998-1999 field season by the meteorite search party of the 39th Japanese Antarctic Research Expedition. Among them two lunar meteorites, Yamato (Y) 981031 and Y983885, had been distinguished by the classification in the field [1]. Judging from texture, mineralogy and bulk composition, Y981031 may be paired with the Y793274 lunar meteorite [1, 2]. Here we report a petrological and mineralogical study of the other meteorite, Y983885.

Sample Description: Y983885 was found on the bare ice field around the Yamato Mountains, Antarctica on January 11, 1999. It is a rounded stone, weighing 288.54g, with a thin yellowish green fusion crust. The recovered sample has some smooth surfaces, possibly indicating original faces. Macroscopic observation of the sample reveals angular white to gray clasts (up to 3 mm in size), white crystalline plagioclases, pyroxenes and dark grains set in a dark fine-grained matrix.

A thin section shows a polymict breccia containing polymineralic and monomineralic clasts (up to 1.2 mm in size) set in a dark brown clastic matrix (Fig. 1). Most of larger clasts are polymineralic, frequently composed of calcic plagioclase, pyroxene and olivine; less commonly plagioclase and olivine, or plagioclase alone. Smaller clasts are dominantly mineral fragments of plagioclase, with some pyroxenes and olivines. Glass spherules, up to 300 μm in diameter, are also observed. These features indicate that Y983885 is a regolith breccia with an abundance of clasts, especially feldspathic ones.

Electron probe analyses show a pyroxene composition range of $Wo_{2–40}$, $Fs_{12–55}$, $En_{14–85}$; a plagioclase range of $An_{89–98}$; and an olivine rage of $Fo_{32–36}$, except one grain of Fo_{55} (Figs. 2 and 3).

Disscussion:

Evidence for lunar origin: The ratios of FeO/MnO for Y983885 are plotted in Fig. 4. Pyroxenes of eucrites consistently have FeO/MnO ~33, and pyroxenes of lunar rocks consistently have FeO/MnO ~69 [3]. The pyroxenes of Y983885 have average FeO/MnO = 64, and a regression line derived from Y983885 data is consistent with a line for lunar pyroxenes (Fig. 4), providing strong evidence for its lunar origin. Further confirmation of the lunar origin of Y983885 should be possible by another mean. The oxygen isotopic composition of a bulk-rock sample of Y983885 is $\delta^{18}O$ = +5.65 ‰, $\delta^{17}O$ = +2.89 ‰, $\Delta^{17}O$ = –0.05 ‰ [4]. The data point of bulk-rock sample falls on the terrestrial fractionation line.

Comparison with other lunar meteorites: Y983885 has an appearance of a regolith breccia with an abundance of feldspathic clasts set in a dark matrix, indicating that the meteorite is an anorthositic regolith breccia. Y983885 is petrologically similar to other anorthositic breccias such as Y793274/Y981031 and Y791197 [5]. Especially, mineral compositions of Y983885 are similar to those of Y791197 [6].

References: [1] Kojima H. et al. (2000) *Antarct. Meteorite Res., 13,* 1–8. [2] Kojima H. (2000) *Antarct. Meteorites, XXV,* 55. [3] Warren P. H. and Kallemeyn G. W. (1989) *GCA, 53,* 3323–3300. [4] Clayton R. N. (2001) *pers. commun.* [5] Yanai K. and Kojima H. (1987) *Photographic Catalog of the Antarctic Meteorites,* NIPR, Tokyo. [6] Yanai K. and Kojima H. (1984) *Mem. Natl Inst. Polar Res., Spec. Issue, 35,* 18–34.

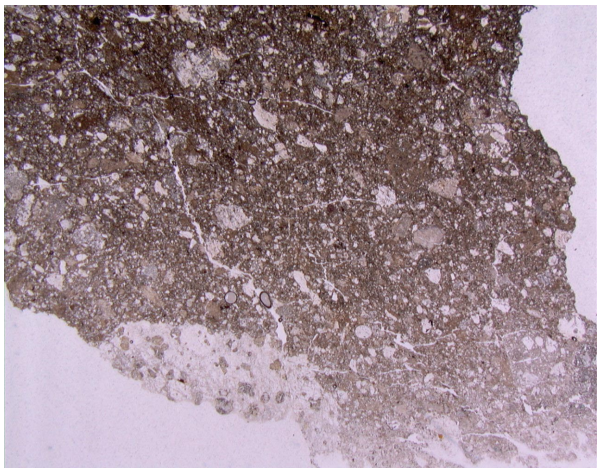

Fig. 1. Photomicrograph of thin section Yamato 983885, 71-1, showing a heterogeneous appearance of polymineralic and monomineralic clasts, and glass spherules set in a dark matrix. Width is 7.5 mm. Plane-polarized light.

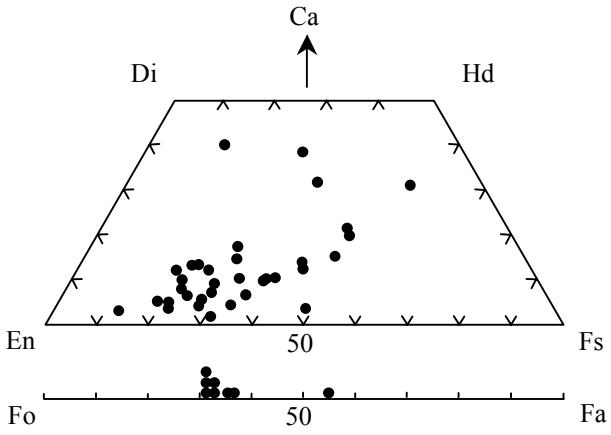

Fig. 2. Pyroxene quadrilateral and olivine compositions in Yamato 983885.

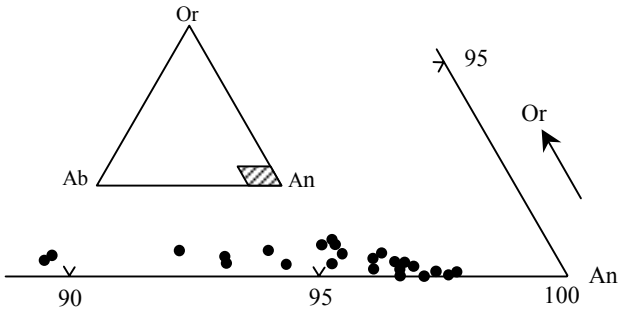

Fig. 3. Chemical compositions of plagioclase in Yamato 983885 plotted in the Ab-An-Or diagram.

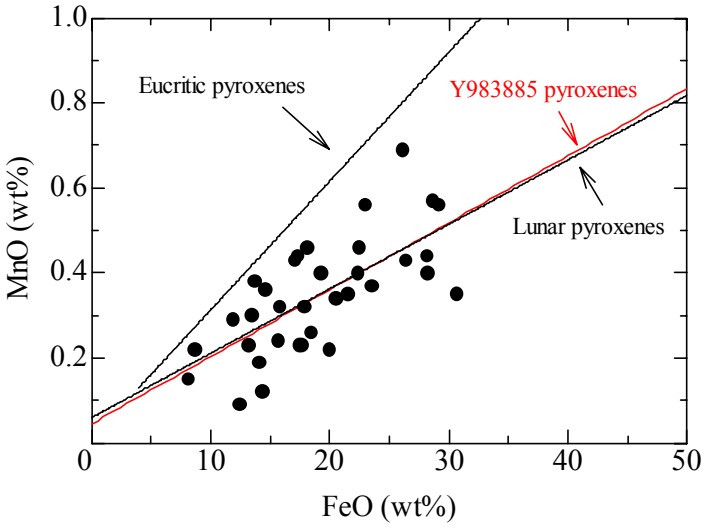

Fig. 4. Pyroxene FeO vs. MnO for Yamato 983885, eucrites and lunar rocks. Data for eucrites and lunar rocks are from [3]. The red line is based on linear regression for the Yamato 983885 data.