79001 – 743.4 grams
79002 - 409.4 grams
Double drive tube
51.3 cm

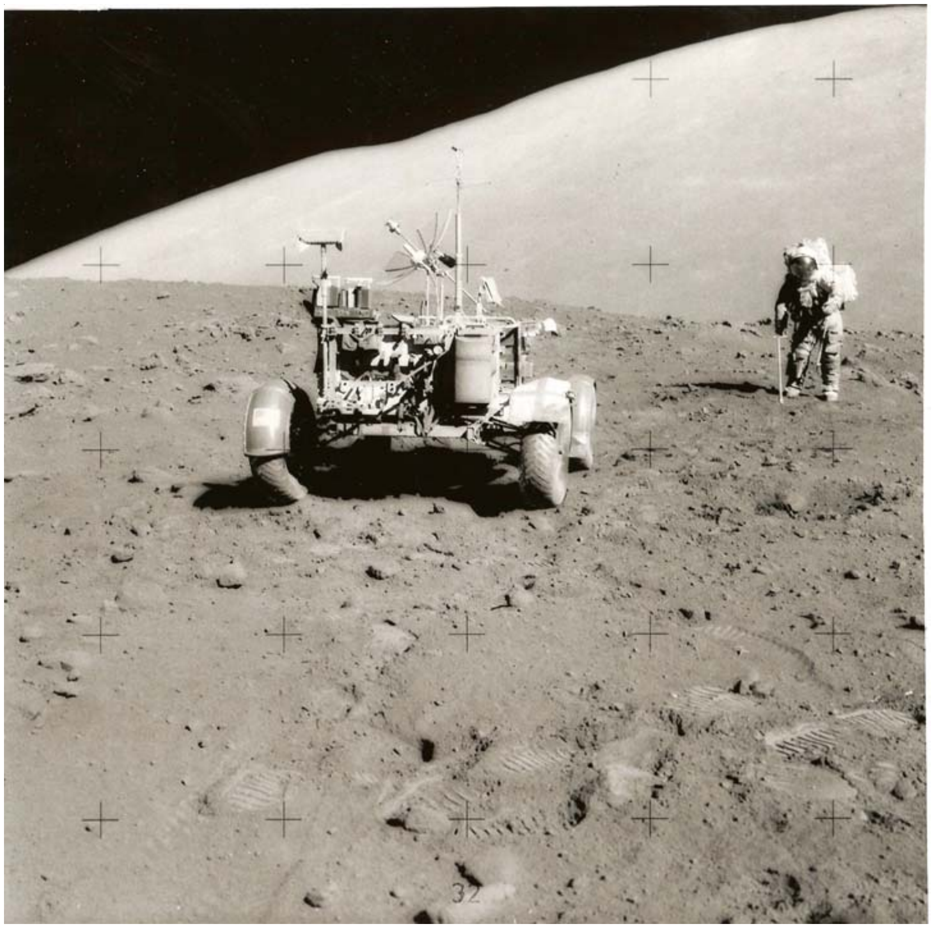


Figure 1: Astronaut collecting double drive tube on rough terrain caused by ejecta from of Van Serg Crater. AS17-143-21836 (note map for fender!)

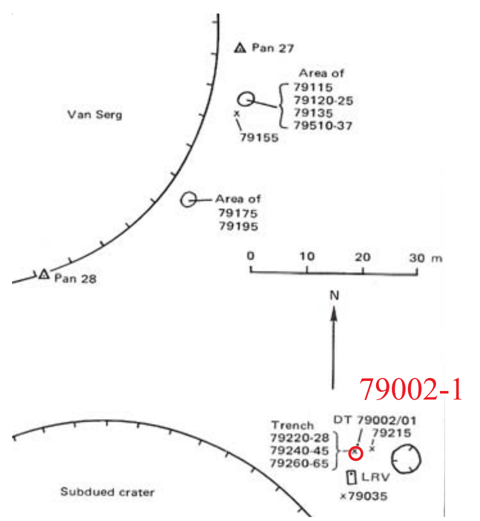


Figure 2: Map of station 9, Apollo 17 showing location of drive tube.

Introduction

A double drive tube was successfully collected at station 9, on the ejecta blanket of Van Serg Crater (figure 1). The location was about 70 m downslope from the rim (figure 2) and about 1 m from the trench sample (79220). 79002 is the upper section, 79001 the lower section of the core. The obvious stratigraphy seen in the trench is not duplicated in the core.

Petrography

The maturity index I_s/FeO of the every 5 mm depth has been determined (figure 3). A very mature layer is found at 5 – 8 cm depth. Morris et al. (1989) found the I_s/FeO to be ~ 40 in that zone, compared to a value of

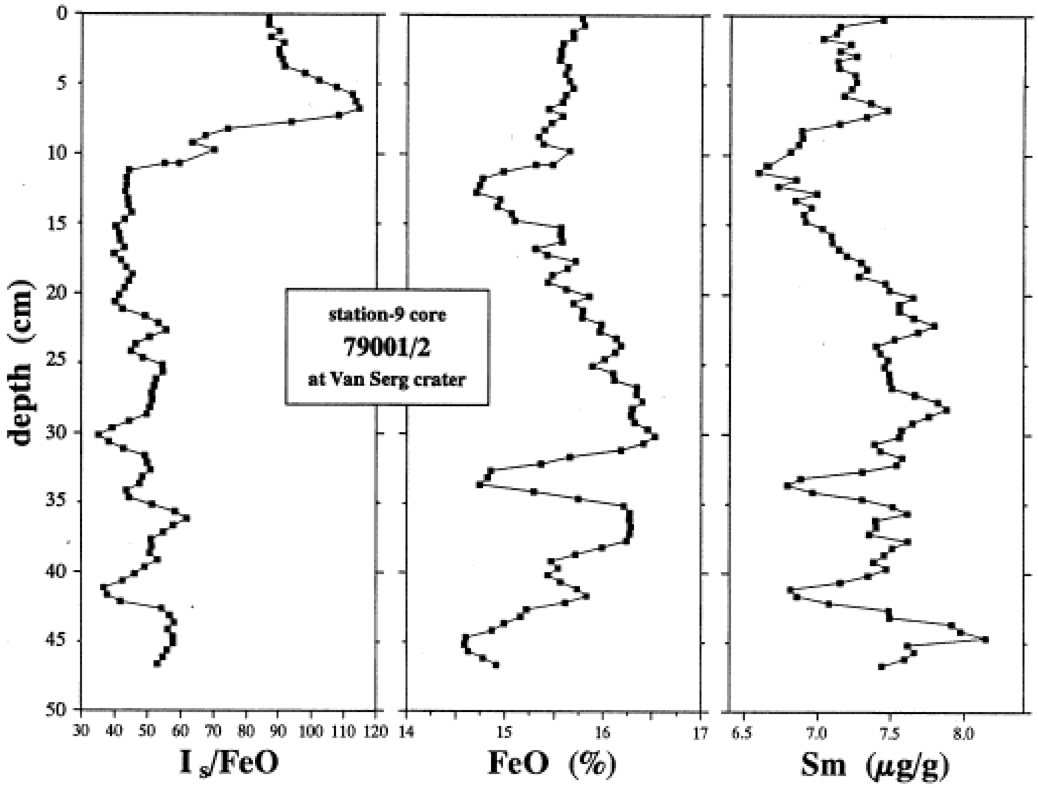


Figure 3: Maturity index and samarium content of 79002/1 (Morris et al.)

~25 for the rest of the core. McKay et al. (1988) found higher agglutinate content (44 %) in that zone as well (figure 5).

There were three visually obvious transitions from light to dark at about 10, 30 and 35 cm depth, but only the first of these transitions correlates with the maturity index.

Graf (1993) plotted the grain size distribution for data obtained by McKay et al. (figure 6).

Chemistry

Morris et al. (1989) determined the composition of 133 splits along the entire length of 79002/1 (every 5 mm). The core was found to be quite homogeneous along its length (the average is given in table 1). The mature section at the top, and the bottom 5 cm may have slightly different composition, as noted by Morris et al., but they are not statistically significant. However, the core has not been analyzed for all elements.

For comparison, Korotev and Kremser (1992) give a more complete analysis for 79221 – collected only 1 meter away.

Transcript

CC We have had a change of heart here again, as usual. And we're going to drop station 10 now that we've hurried you so much, and we're going to get a double core here. And we'd like to get some football-size rocks while you're doing that. And then we're going to leave here and go back to the LM.

LMP You don't want a double core here. I don't think we can do it, Bob. It's too rocky.

CDR You don't think we'll get through that stuff you just trenched?

LMP Well, I'm afraid there are rocks all through it.

CDR Let's try it.

- _

LMP The first core was easy: the second one a little tougher: and then it got tough down at the end. There, I'm getting a picture of you. Okay. I got it.

CDR Core but it want to slide out. It's full. No rocks in it. It looks just like the same stuff we've been traveling through.

- - -

CDR It's very loose spoil, just any little movement and you'll lose some of it. The top rammed down – Oh, almost half way without any effort. The bottom rammed down about an inch.

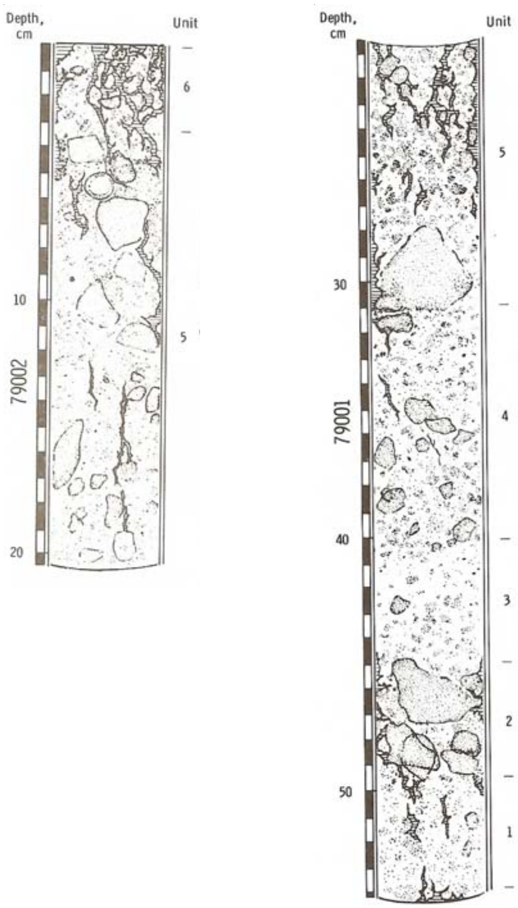


Figure 4: Artist sketch of X-ray of double drive tube 79002 and 79001. 79002 is the top Length is 54 cm.

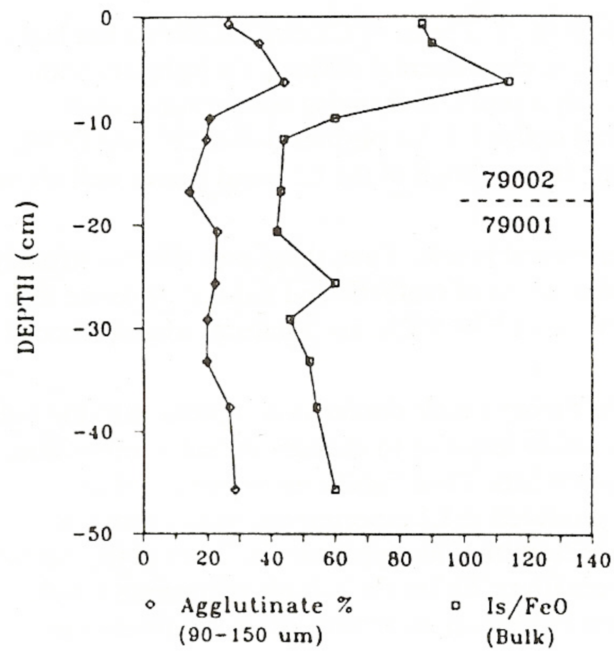


Figure 5: Agglutinate content of 79002/1 double drive tube (McKay et al. 1989).

Other Studies

Stone and Clayton (1989) determined the isotopic composition of nitrogen as function of release temperature (figure 7).

Processing

According to Mitchell et al. (1973), it took less than 19 hammer blows to drive the core. *A footnote in table 8 therein, mentions that 41 cm^3 of material may have fallen out of the top of 79001 (a section in the middle)!*

Duke and Nagle (1976) give a preliminary "description" of the X-ray image of the core (*there is no mention of a missing section).* 79002 (upper section) was not dissected until 1986 and described in newsletter 47. 79001 was dissected in 1987 and described in newsletter 49.

Three sets of thin sections were prepared from epoxy-impregnated residue (figure 8). A detailed petrological study has not been performed on this core, presumably because the trench samples nearly were more interesting. Particles seen in figure 8 and those extracted during dissection have not been studied.

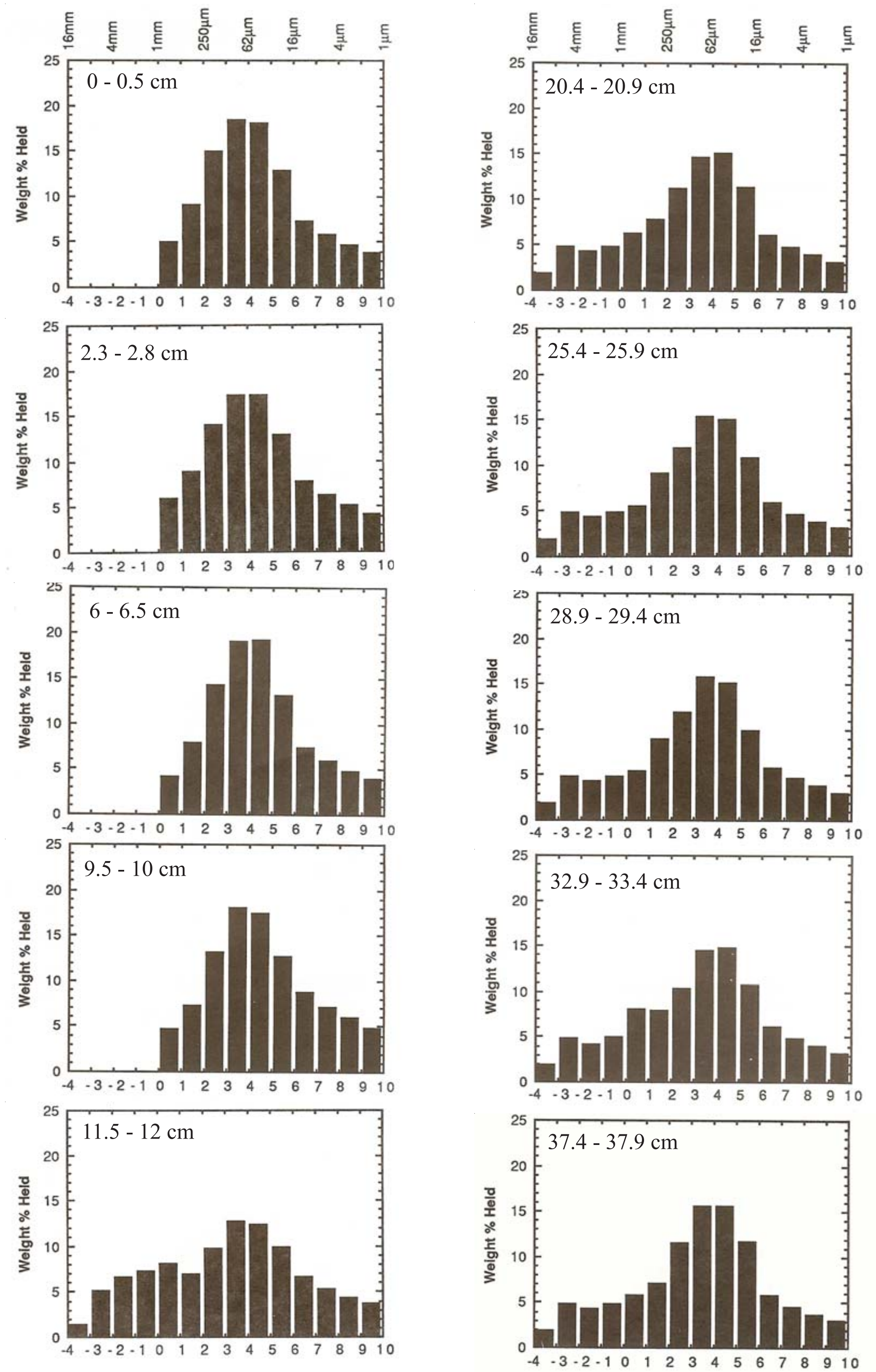


Figure 6a: Grain size distribution for 79002/1 (Graf 1993, from data by McKay et al.). The coarse fines were handpicked because they were friable, thus causing an artificial "discontinuity" in the histogram.

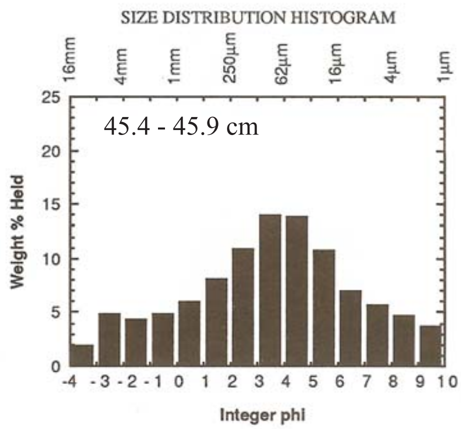


Figure 6b: Grain size distribution 79002/1 (cont.)

LSPET (1973c) Preliminary examination of lunar samples. Apollo 17 Preliminary Science Report. NASA SP-330, 7-1—7-46.

McKay D.S., Wentworth S.J. and Basu A. (1988) Core 79001/2: An example of extreme mixing in the lunar regolith (abs). *Lunar Planet. Sci.* **XIX**, 758-759.

Mitchell J.K., Carrier W.D., Costes N.C., Houston W.N., Scott R.F. and Hovland H.J. (1973) 8. Soil-Mechanics. *In* Apollo 17 Preliminary Science Rpt. NASA SP-330. pages 8-1-22.

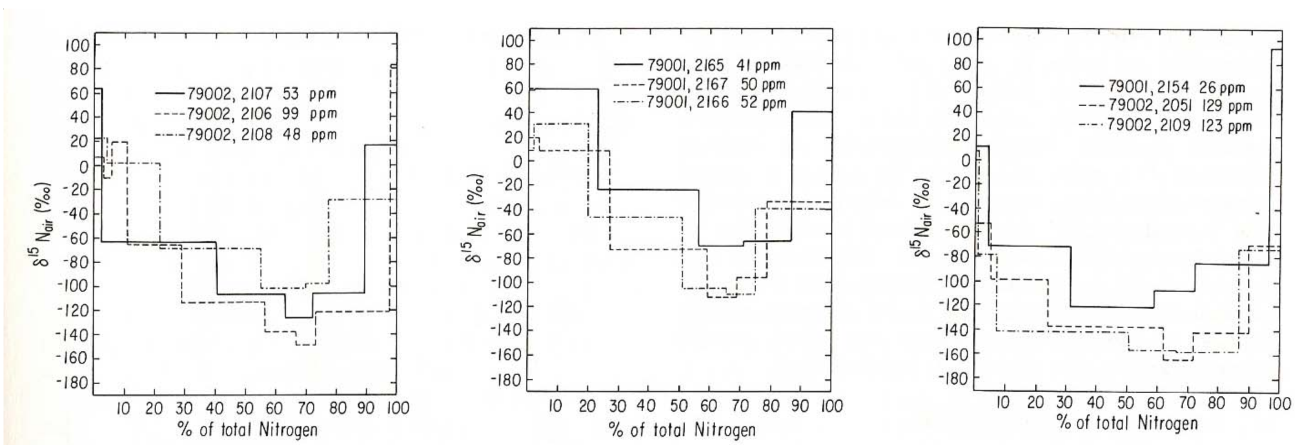


Figure 7: Nitrogen isotopes as function of release temperature for different subsamples of double drive tube 79002/1 (Stone and Clayton 1988).

References for 79001-2 core

Butler P. (1973) Lunar Sample Information Catalog Apollo 17. Lunar Receiving Laboratory. MSC 03211 Curator's Catalog. pp. 447.

Duke M.B. and Nagle J.S. (1976) Lunar Core Catalog. JSC09252 rev. Curators' Office

Fryxell R. and Heiken G. (1974) Preservation of lunar core samples: Preparation and interpretation of three-dimensional stratigraphic sections. *Proc. 5th Lunar Sci. Conf.* 935-966.
.Graf J.C. (1993) Lunar Soils Grain Size Catalog. NASA Reference Pub. 1265, March 1993

Korotev R.L. and Kremser D. (1992) Compositional variations in Apollo 17 soils and their relationships to the geology of the Taurus-Littrow site. *Proc. 22nd Lunar Planet. Sci. Conf.* 275-301.

LSPET (1973a) Apollo 17 lunar samples : Chemical and petrographic description. *Science* **182**, 659-690.

Morris R.V., Korotev R.L. and Lauer H.V. (1989) Maturity and geochemistry of the van Serg core (79001/2) with implications for micrometeorite compositions. *Proc. 19th Lunar Planet. Sci. Conf.* 269-284.

Stone J. and Clayton R.N. (1989) Nitrogen isotopes in drive tube 79002/79001: Regolith history and nitrogen isotopic evolution in the solar wind. *Proc. 19th Lunar Planet. Sci. Conf.* 285-295.

Wolfe E.W., Bailey N.G., Lucchitta B.K., Muehlberger W.R., Scott D.H., Sutton R.L and Wilshire H.G. (1981) The geologic investigation of the Taurus-Littrow Valley: Apollo 17 Landing Site. US Geol. Survey Prof. Paper, 1080, pp. 280.

Table 1. Chemical composition of 79001.

reference	Morris89			
weight	average	top	bottom	
SiO2 %		ave 18	ave 10	
TiO2		mature	high La	
Al2O3				
FeO	15.6	15.6	14.9	(a)
MnO				
MgO				
CaO				
Na2O	0.4	0.406	0.41	(a)
K2O				
P2O5				
S %				
sum				
Sc ppm	50.3	49.6	45.3	(a)
V				
Cr	2924	2895	2783	(a)
Co	36.1	38.6	38.1	(a)
Ni	186	255	218	(a)
Cu				
Zn				
Ga				
Ge ppb				
As				
Se				
Rb				
Sr				
Y				
Zr				
Nb				
Mo				
Ru				
Rh				
Pd ppb				
Ag ppb				
Cd ppb				
In ppb				
Sn ppb				
Sb ppb				
Te ppb				
Cs ppm				
Ba	102	103	117	(a)
La	8.56	8.72	10.43	(a)
Ce	25.3	24.8	30	(a)
Pr				
Nd				
Sm	7.32	7.22	7.68	(a)
Eu	1.51	1.52	1.46	(a)
Gd				
Tb	1.68	1.73	1.68	(a)
Dy				
Ho				
Er				
Tm				
Yb	6.09	6.02	6.19	(a)
Lu	0.86	0.86	0.86	(a)
Hf	6.39	6.27	6.55	(a)
Ta	1.07	1.09	1.01	(a)
W ppb				
Re ppb				
Os ppb				
Ir ppb	6	7.7	8.7	(a)
Pt ppb				
Au ppb				
Th ppm	1.06	1.08	1.5	(a)
U ppm				

technique (a) INAA

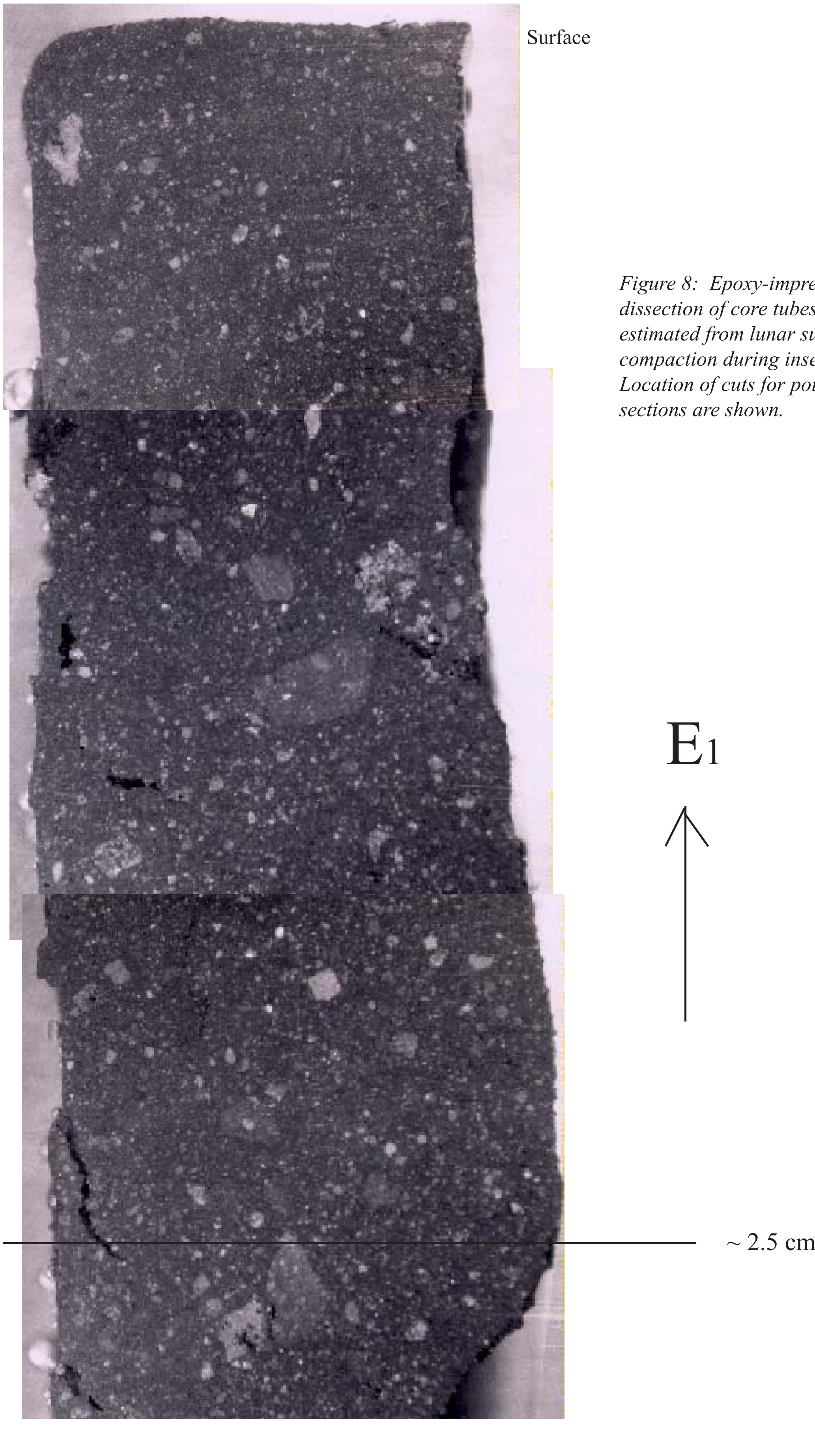
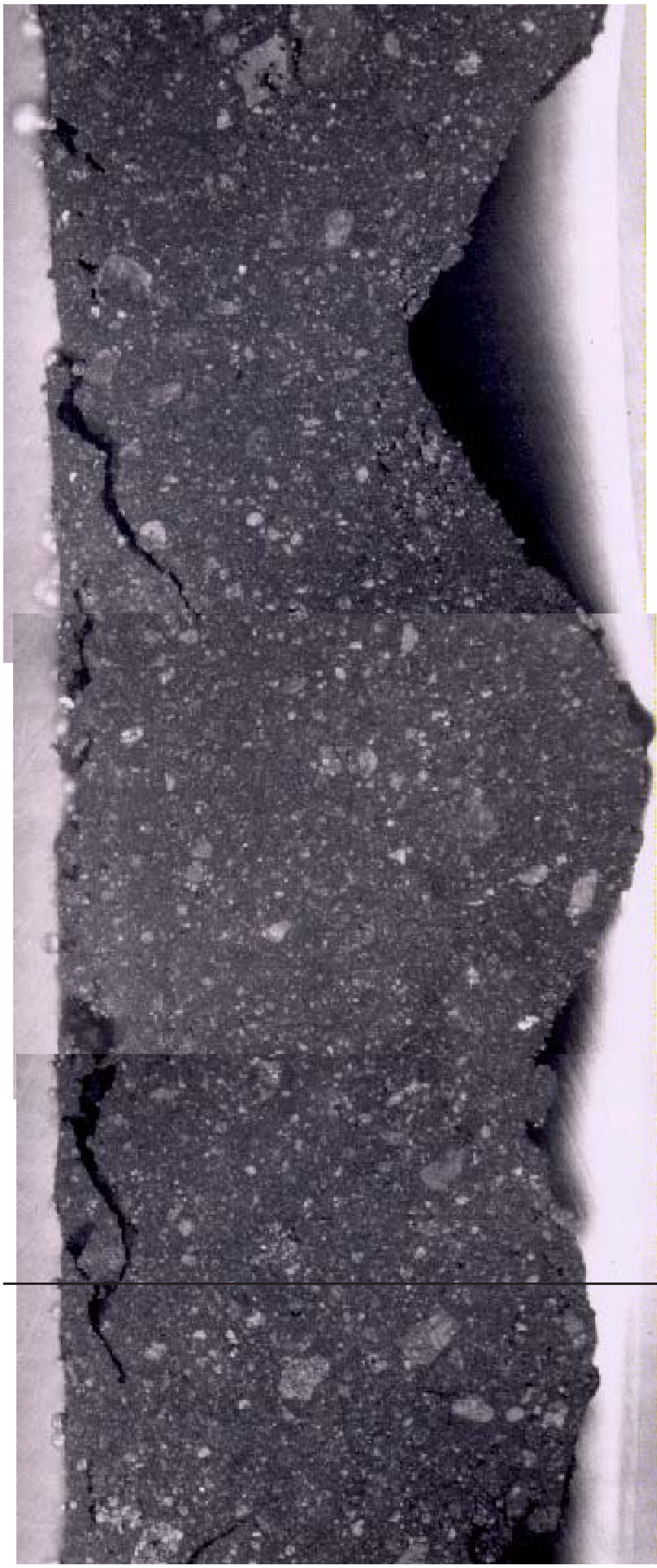


Figure 8: Epoxy-impregnated residue after dissection of core tubes 79002/1. Depth is estimated from lunar surface, considering compaction during insertion and extrusion. Location of cuts for potted butts and thin sections are shown.

79002

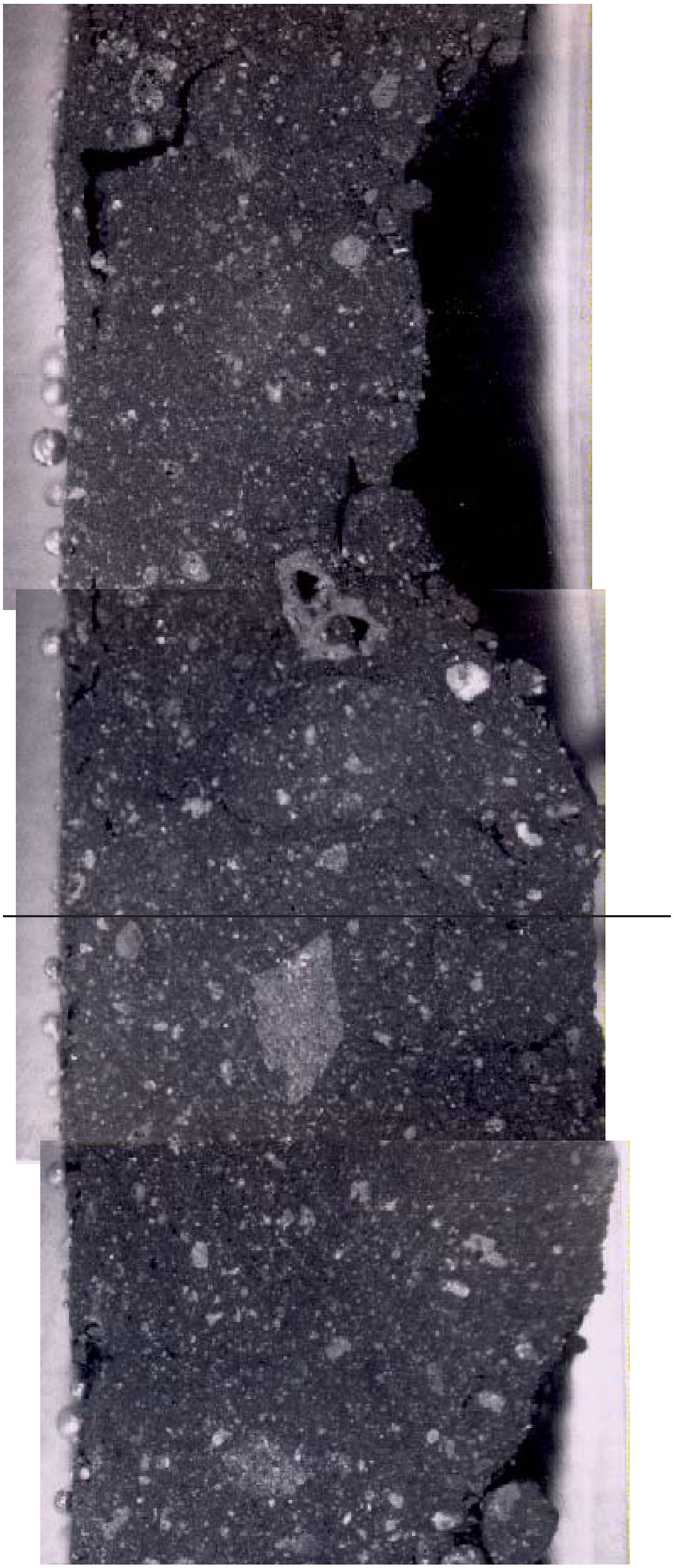


,6008 PB

,6017 ts
,6018 ts
,6019 ts

~ 5 cm

79002

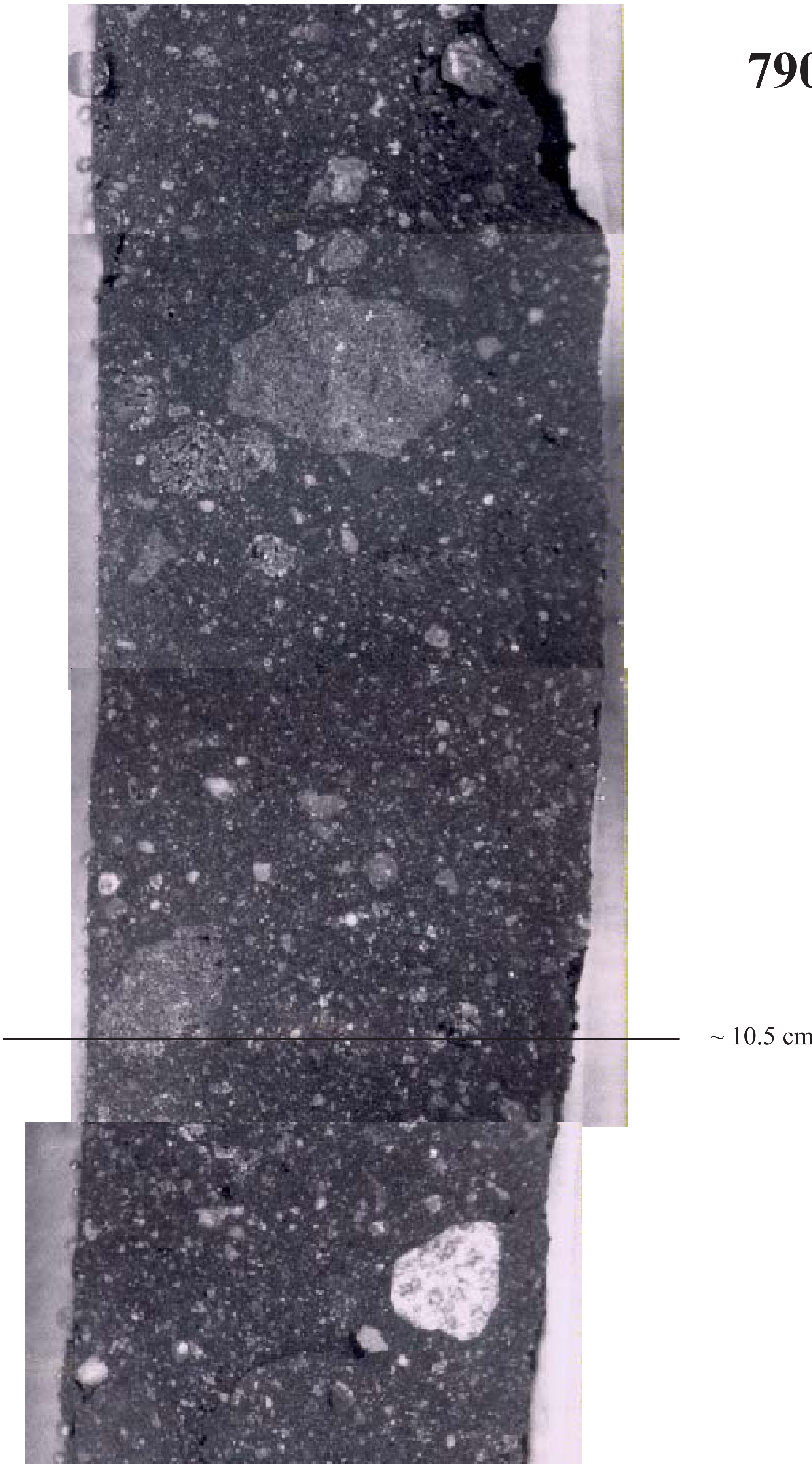


,6009 PB

,6020 ts
,6021 ts
,6022 ts

~ 7.5 cm

79002



79002

,6011 PB

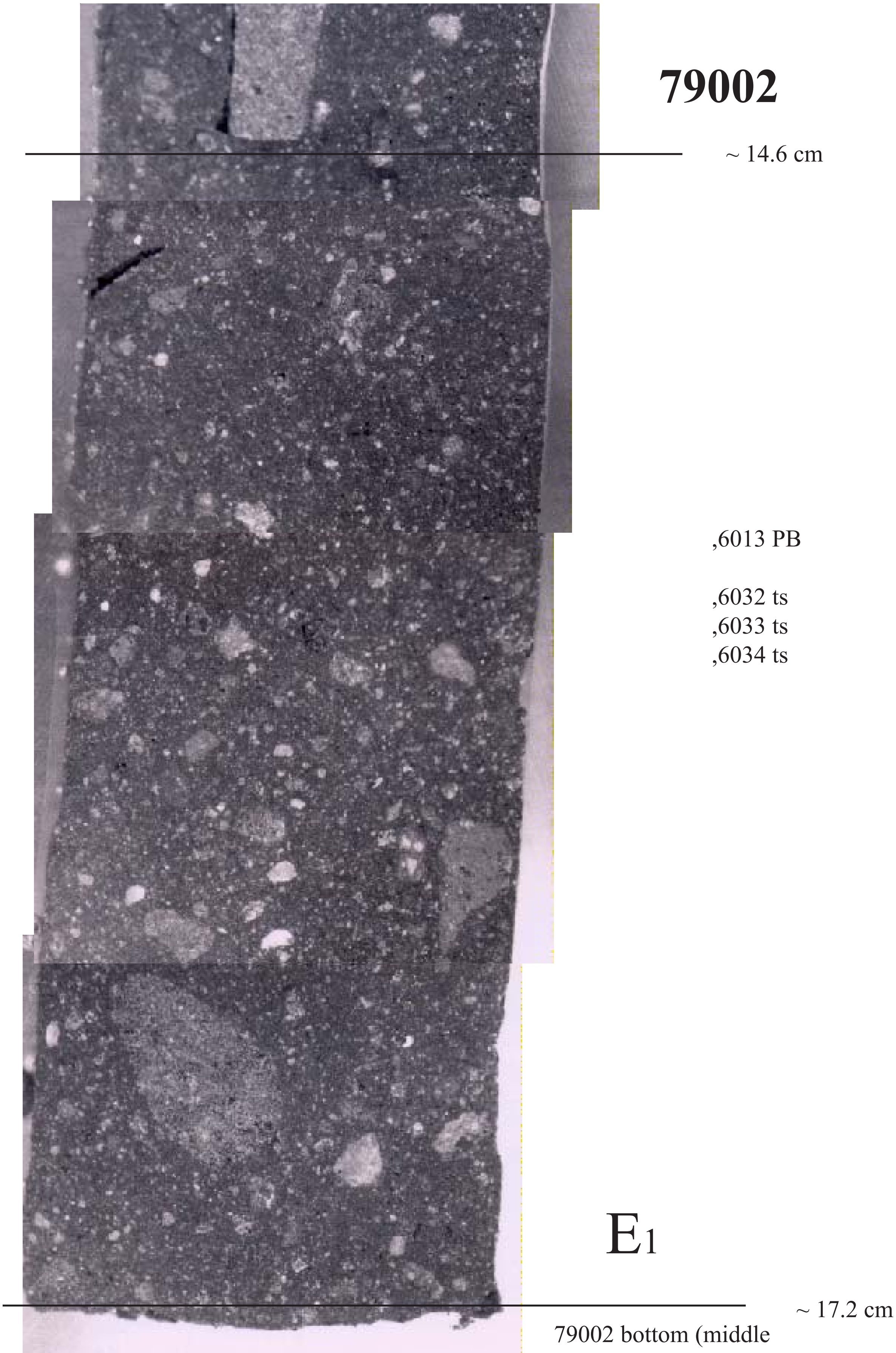
,6026 ts
,6027 ts
,6028 ts

~ 12.3 cm

,6012 PB

,6029 ts
,6030 ts
,6031 ts

79002

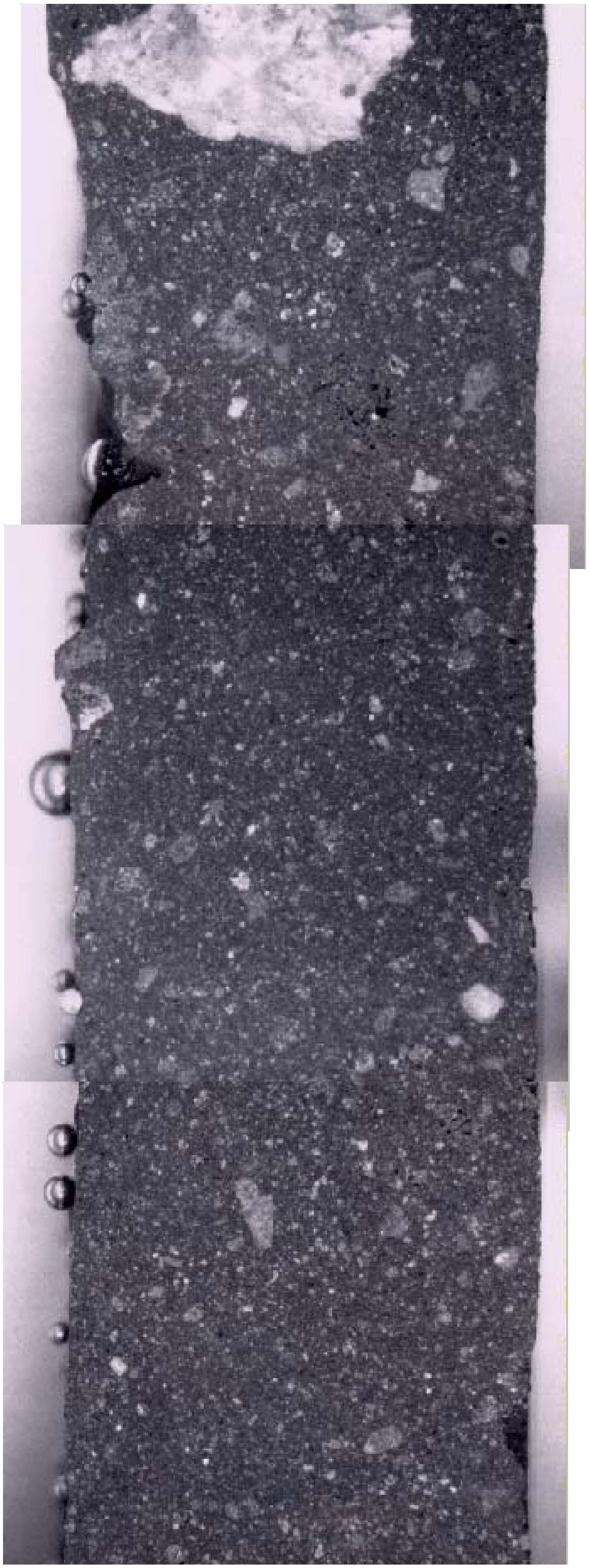


79002 bottom (middle of double drive tube) middle

CAUTION: A large amount of material may be missing!

79001

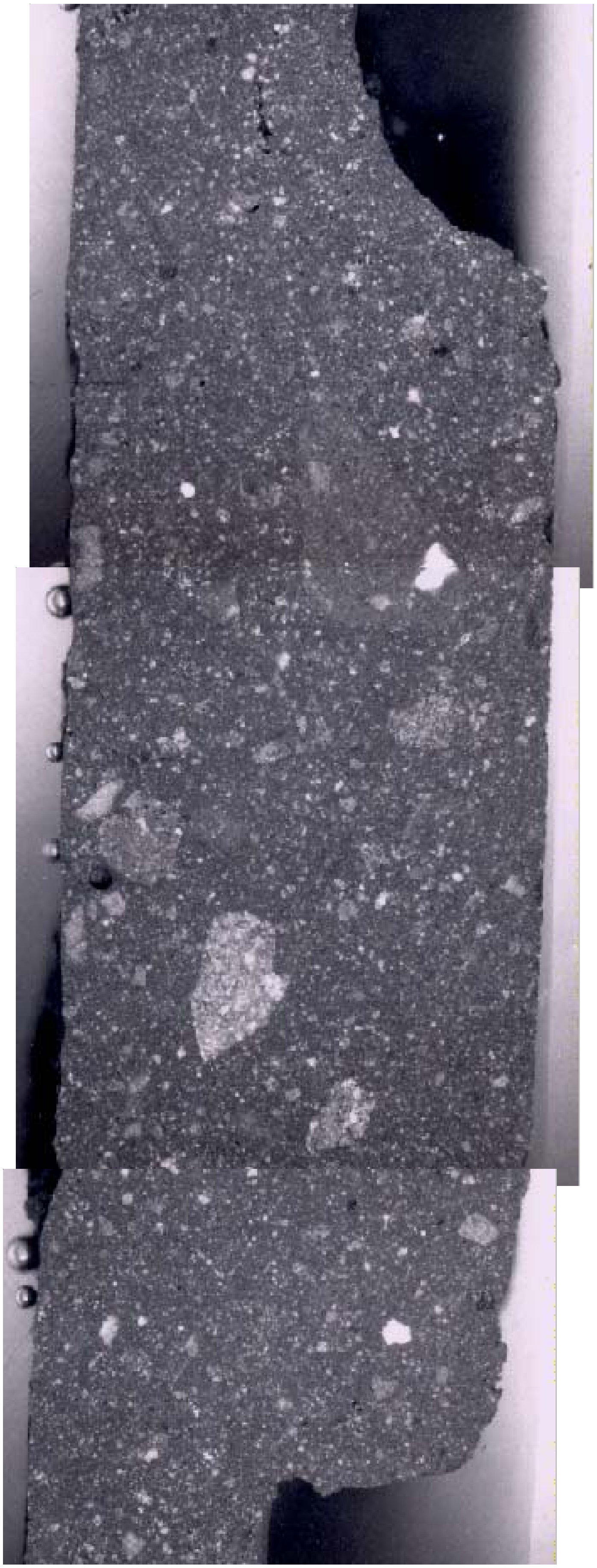
E1



79001

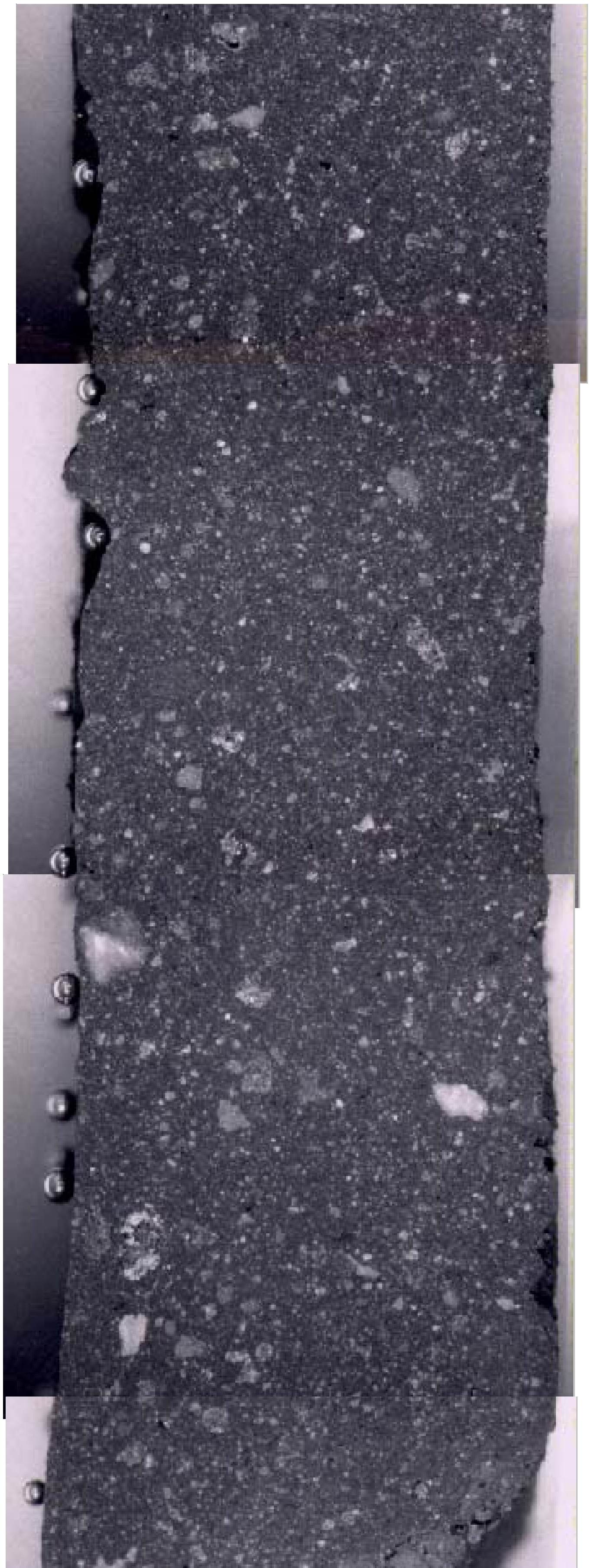
79001

79001

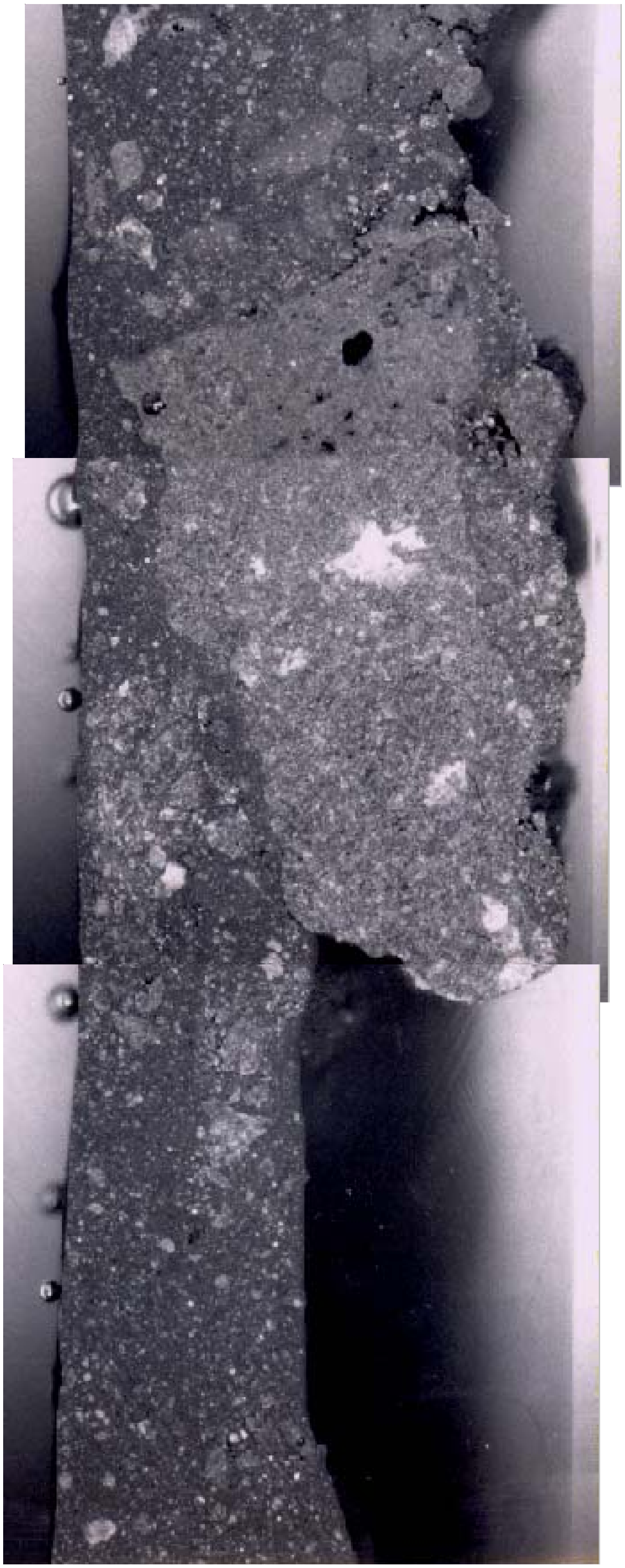


79001

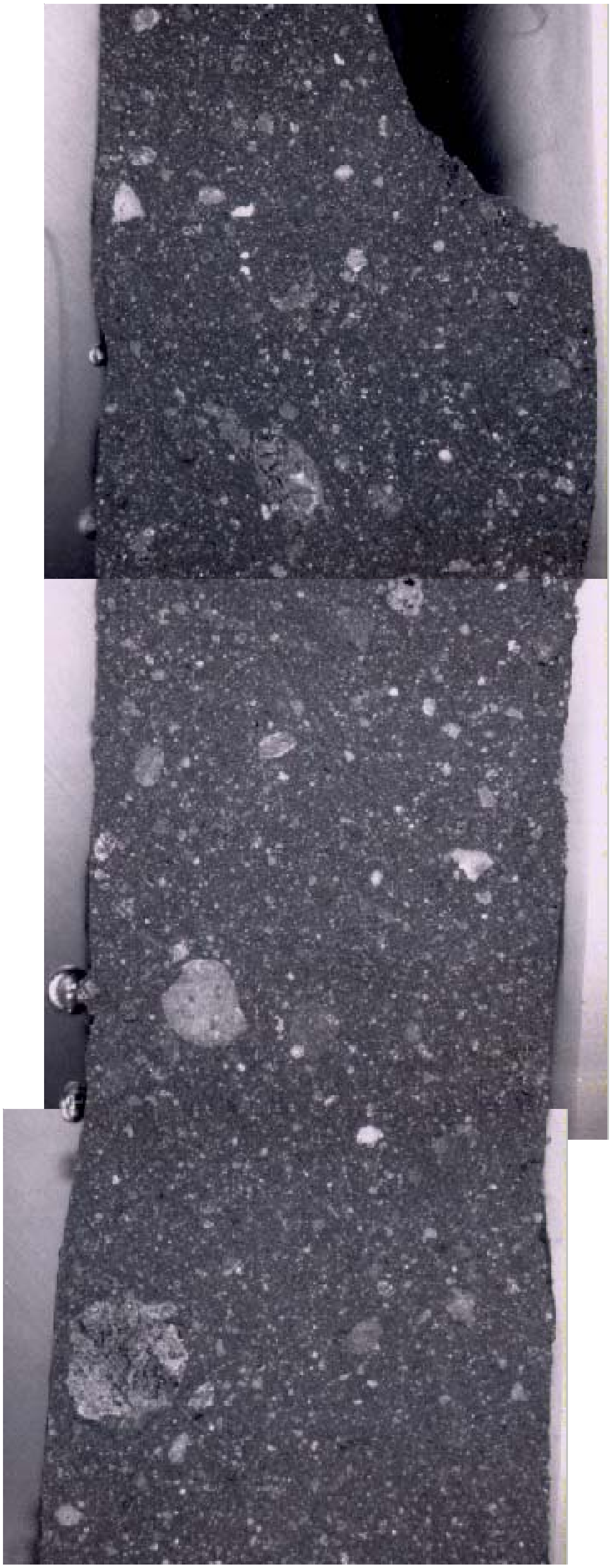
79001



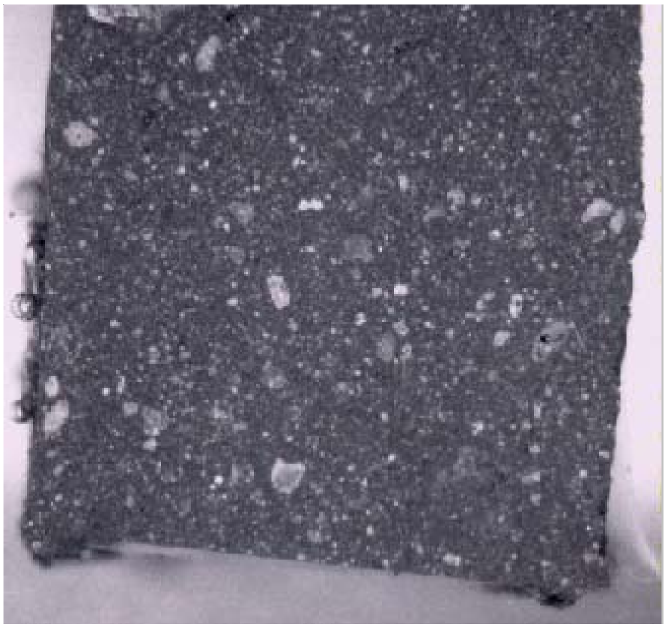
79001



79001



79001



79001

bottom