BRACHINITE NWA 3151 AND (?)BRACHINITE NWA 595. A. J. Irving[1], S. M. Kuehner[1] and D. Rumble, III[2], [1]Earth & Space Sciences, University of Washington, Seattle, WA 98195 irving@ess.washington.edu, [2]Geophysical Laboratory, Carnegie Institution, Washington, DC 20015.

Brachinites are rare clinopyroxene-bearing, dunitic achondrites with very ancient formation ages [1, 2]. A 1500 gram fairly fresh, dark brown stone with thin translucent fusion crust acquired in Morocco by Greg Hupé (provisional number NWA 3151) is the seventh known member of this group. Re-examination and oxygen isotopic analysis of NWA 595 indicate that it may be an ungrouped ultramafic achondrite unrelated to the brachinite parent body.

Petrology of NWA 3151: This dunitic rock is relatively coarse grained (0.7-1.6 mm) with a polygonal-granular texture. It is composed predominantly of olivine (~95 vol.%, $Fa_{35.7}$, FeO/MnO ~ 81) with minor clinopyroxene ($Fs_{10.5\text{-}10.6}Wo_{44.7\text{-}45.2}$, FeO/MnO ~ 44, Cr_2O_3 = 0.65 wt.%, Al_2O_3 = 0.95 wt.%), altered metal (with some relict taenite), troilite, chromite (Cr/(Cr+Al) = 0.729), and very rare K-poor, sodic plagioclase ($An_{36.2\text{-}39.9}Or_{0.2}$) and orthopyroxene. This rock has many similarities to brachinites EET99402/EET99407 [1].

Petrology of NWA 595: We have confirmed the previous description and mineral compositions for NWA 595 [3] (except that we judge the weathering grade to be only W2-3); yet some features are not consistent with its original classification as a brachinite. In comparison with Brachina, Eagles Nest, Reid 013, Hughes 026, ALH84025 and EET99402/7, NWA 595 has less ferroan olivine ($Fa_{28\text{-}30}$), more orthopyroxene, no plagioclase, and significantly lower FeO/MnO ratios for both olivine (~50) and clinopyroxene (~30), causing it to plot outside the main brachinite field defined by [4].

Oxygen Isotopic Compositions: Replicate analyses of acid-washed whole rock samples by laser fluorination gave $\delta^{18}O$ = +4.86 ± 0.03, $\delta^{17}O$ = +2.42 ± 0.02, $\Delta^{17}O$ = -0.15 ± 0.02 per mil for NWA 3151, and $\delta^{18}O$ = +5.30 ± 0.05, $\delta^{17}O$ = +2.66 ± 0.04, $\Delta^{17}O$ = -0.09 ± 0.01 per mil for NWA 595. The values for NWA 3151 are very similar to those for other brachinites [5] (and for ultramafic achondrite QUE 93148 [4, 6]), whereas the values for NWA 595 plot closer to the TFL.

Brachinite Parent Body Brachinites may represent residual mantle rocks, or possibly recrystallized igneous cumulates [1], from a disaggregated, differentiated planetary body in the very early asteroid belt. Although similar in oxygen isotopic composition to HEDO group meteorites, mesosiderites and angrites [5], the brachinites have different FeO/MnO systematics (and have more ancient formation ages than the first two types), implying that they derive from a separate body.

References: [1] Nehru C. et al. 1996 *LPS XXVII*, 943-944; Mittlefehldt D. et al. 2003 *MAPS*, *38*, 1601-1625 [2] Wadhwa M. et al. 1998 *LPS XXIX*, #1480 [3] Russell S. et al. 2002 *Met. Bull.*, *86* [4] Goodrich C. and Righter K. 2000 *MAPS*, *35*, 521- 535 [5] Clayton R. and Mayeda T. 1996 *GCA*, *60*, 1999-2018 [6] Floss C. 1999 *LPS XXX*, #1149.