COSMOGENIC RADIONUCLIDES IN BUNBURRA ROCKHOLE ACHONDRITE FALL. K. C. Welten¹, K. Nishizumi¹, M. W. Caffee², M. M. M. Meier³, P. A. Bland⁴, P. Spurny⁵, ¹Space Sciences Laboratory, Univ. of California, Berkeley, CA 94720-7450, USA. ²PRIME Laboratory, Purdue Univ., West Lafayette, IN 47907, USA. ³Isotope Geology, ETH Zürich, CH-8092 Zürich, Switzerland. ⁴IARC, Dept. of Earth Science & Engineering, Imperial College, London, SW7 2AZ, UK. ⁵Astronomical Institute of the Academy of Sciences, Fríkova 298, CA-251 65 Ondrejov Observatory, Czech Republic.

Introduction: In October, 2008, the Bunburra Rockhole (BBR) achondrite fall was recovered in the Nullarbor region of Australia based on fireball data from the Desert Fireball Network [1,2]. It is the first achondrite with an accurately known orbit, which is characterized as an Aten-type orbit. While the mineralogy and bulk composition suggested that BBR is a eucrite, oxygen isotope analysis have indicated it is an ungrouped achondrite [1]. We received a chip of BBR for cosmogenic nuclide analyses. Here we report the cosmogenic radionuclide concentrations, while the noble gas concentrations are reported in [3].

Experimental methods. We dissolved 61.5 mg of BBR along with Be and Cl carriers in HF/HNO₃. After dissolution, we separated Be, Al, Cl, and Ca. An aliquot was taken for chemical analysis. AMS measurements of ¹⁰Be, ²⁶Al and ³⁶Cl were performed at PRIME lab, Purdue University. We report ³⁶Cl, while ¹⁰Be and ²⁶Al results will be reported at the meeting.

Results and discussion. The bulk composition of BBR, including a Fe/Mn ratio of ~32, is consistent with HED meteorites, but does not rule out a distinct ungrouped achondrite. Figure 1 shows that the cosmogenic ³⁶Cl concentration of 16.8±0.8 dpm/kg is consistent with a small pre-atmospheric mass of ~50 kg (R=15 cm), as derived from the fireball data, and thus indicate a minimum CRE age of ~1 Myr. The ¹⁰Be and ²⁶Al data will further constrain the pre-atmospheric size as well as the CRE age of BBR.


Fig. 1. ³⁶Cl concentration in BBR vs. calculated depth profiles.

Table 1. Concentrations of major elements (in wt%) and cosmogenic ³⁶Cl (in dpm/kg) in Bunburra Rockhole.

<table>
<thead>
<tr>
<th>Element</th>
<th>Mg</th>
<th>Al</th>
<th>Ca</th>
<th>Mn</th>
<th>Fe</th>
<th>³⁶Cl</th>
<th>³⁶Cl*</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBR</td>
<td>3.7</td>
<td>6.2</td>
<td>6.9</td>
<td>0.43</td>
<td>14.0</td>
<td>16.8±0.8</td>
<td>24±1</td>
</tr>
</tbody>
</table>

*normalized to Fe+8Ca