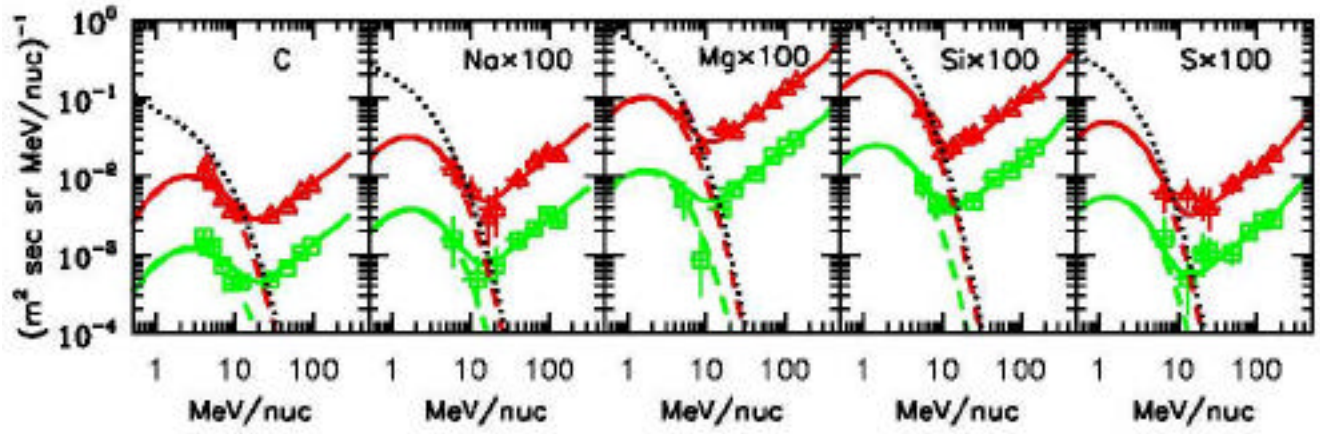
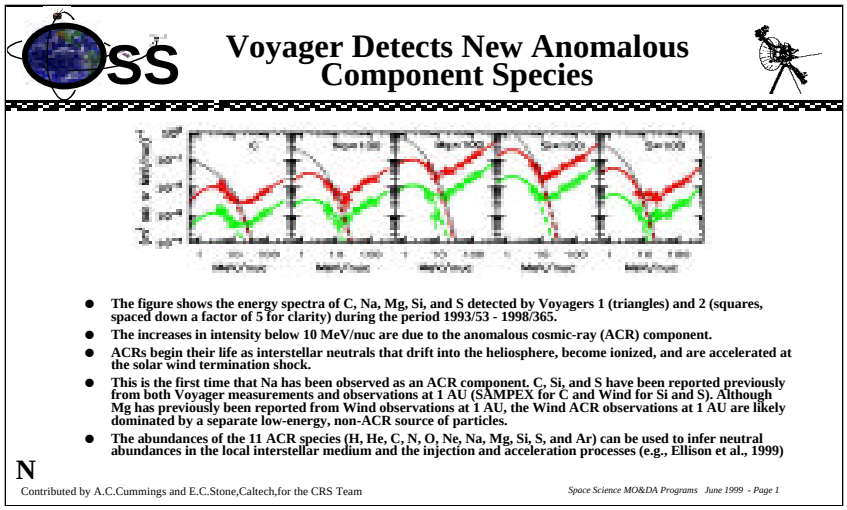
Voyager Detects New Anomalous Component Species



- **The figure shows the energy spectra of C, Na, Mg, Si, and S detected by Voyagers 1 (triangles) and 2 (squares, spaced down a factor of 5 for clarity) during the period 1993/53 - 1998/365.**
- **The increases in intensity below 10 MeV/nuc are due to the anomalous cosmic-ray (ACR) component.**
- **ACRs begin their life as interstellar neutrals that drift into the heliosphere, become ionized, and are accelerated at the solar wind termination shock.**
- **This is the first time that Na has been observed as an ACR component. C, Si, and S have been reported previously from both Voyager measurements and observations at 1 AU (SAMPEX for C and Wind for Si and S). Although Mg has previously been reported from Wind observations at 1 AU, the Wind ACR observations at 1 AU are likely dominated by a separate low-energy, non-ACR source of particles.**
- **The abundances of the 11 ACR species (H, He, C, N, O, Ne, Na, Mg, Si, S, and Ar) can be used to infer neutral abundances in the local interstellar medium and the injection and acceleration processes (e.g., Ellison et al., 1999)**

Contributed by A.C.Cummings and E.C.Stone,Caltech,for the CRS Team



The figure shows the energy spectra of Carbon (C), Sodium (Na), Magnesium (Mg), Silicon (Si), and Sulfur (S) detected by Voyagers 1 (triangles) and 2 (squares, spaced down a factor of 5 for clarity) during the period 1993/53 - 1998/365.

The increases in intensity below 10 MeV/nuc are due to the anomalous cosmic-ray (ACR) component. ACRs begin their life as interstellar neutrals that drift into the heliosphere, become ionized, and are accelerated at the solar wind termination shock.

The dashed curves are model calculations using a full-drift, two-dimensional numerical model of singly-charged ACRs (Steenberg et al. (1999). The solid curves are the sum of ACRs and galactic cosmic rays, which fit the observations quite well. The dotted curves are the ACR spectra at the shock.

This is the first time that Na has been observed as an ACR component. C, Si, and S have been reported previously from both Voyager measurements and observations at 1 AU (SAMPEX for C and Wind for Si and S). Although Mg has previously been reported from Wind observations at 1 AU, a detailed study (Cummings et al., 1999) has revealed that the Wind ACR observations at 1 AU are likely dominated by a separate low-energy, non-ACR source of particles.

The abundances of the 11 ACR species (Hydrogen [H], Helium [He], C, Nitrogen [N], Oxygen [O], Ne, Na, Mg, Si, S, and Argon [Ar]) can be used to infer neutral abundances in the local interstellar medium and the injection and acceleration processes (e.g., Ellison et al., 1999). See Cummings et al. (1999) for more details.

References

Cummings A. C., Stone, E. C., & Steenberg, C. D., Proc. 26th ICRC, Salt Lake City, pap. SH 4.3.03, 1999.

Ellison, D. C., Jones, F. C., & Baring, M. G., ApJ, in press, 1999.

Steenberg, C. D., Cummings, A. C., & Stone, E. C., Proc. 26th ICRC, Salt Lake City, pap. SH 4.4.03, 1999.

Contributed by A.C.Cummings and E.C.Stone,Caltech,for the CRS Team

See http://vraptor.jpl.nasa.gov/voyager/science notes.html for earlier Voyager science news items.

- **This finding provides new knowledge of interstellar neutrals and anomalous cosmic rays**
- Relevance to the Sun-Earth Connection Roadmap:
  - **Quest 1** - Why Does the Sun Vary?
    - **Campaign 2** - Solar Wind and Heliosphere Effects
  - **Quest 3** - How Do the Sun and Galaxy Interact?
    - **Campaign 5** - Nearby Galactic Environment