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TIME AND ENERGY DEPENDENCE OF THE COSMIC RAY GRADIENT
IN THE OUTER HELIOSPHERE

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ABSTRACT

Pioneers 10 and 11, now 35 and 18 AU from the sun, continue to extend our knowledge of the spatial dependence of cosmic ray intensities in the heliosphere. We report radial gradients measured from these spacecraft by UCSD detectors which have integral energy responses above thresholds of 80 and 500 MeV/nucleon. An average gradient of $\sim 2\%$ /AU typifies the data set as a whole, but there are time and energy dependences that deviate from this value.. With operating lifetimes of 13 and 12 years, respectively, for the two spacecraft, we have followed the time dependence for over a solar cycle.. The higher energy channel shows less modulation on all time scales.. At the start of the present cycle, the gradient is lower than the average value during the last solar cycle.

INSTRUMENTATION

Table I outlines the characteristics of the four UCSD data channels used in this report..

Table I

CHARACTERISTICS OF FOUR UCSD DATA CHANNELS

	Z = 1 Energy Range	Relative Response (Ratio)	Z > 1 Energy Range
M3	80<E<300 MeV	50 : 50	>80 MeV/nucl
M1	>80 MeV	90 : 10	>80 MeV/nucl
C1	>500 MeV	80 : 20	>500 MeV/nucl
C3	>500 MeV	30 : 70	>500 MeV/nucl

OBSERVATIONS

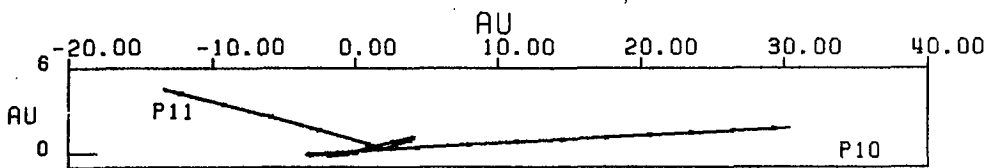
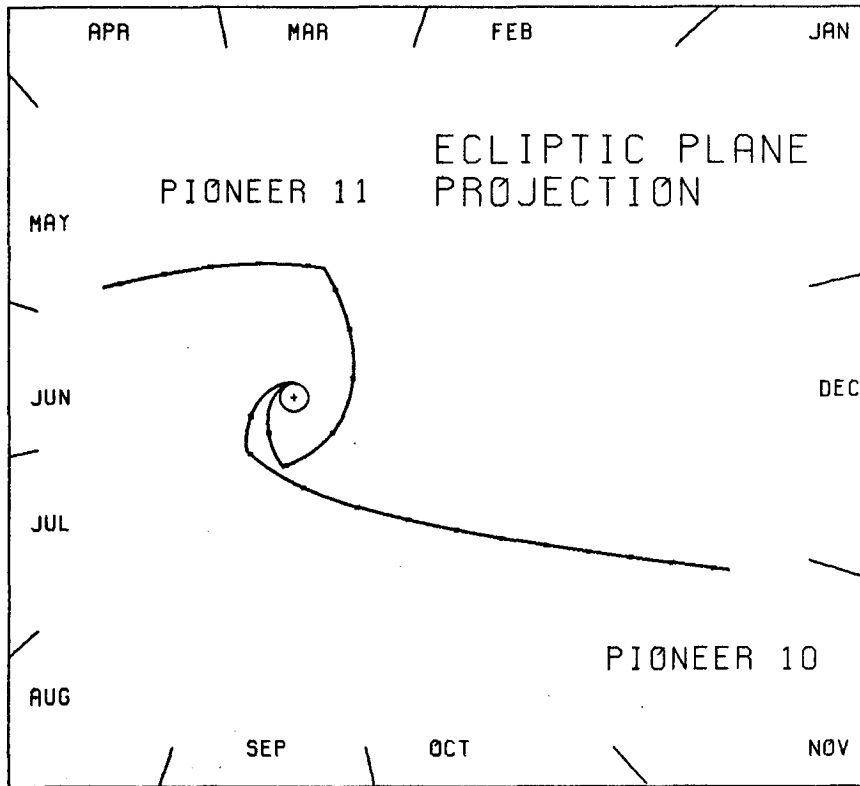
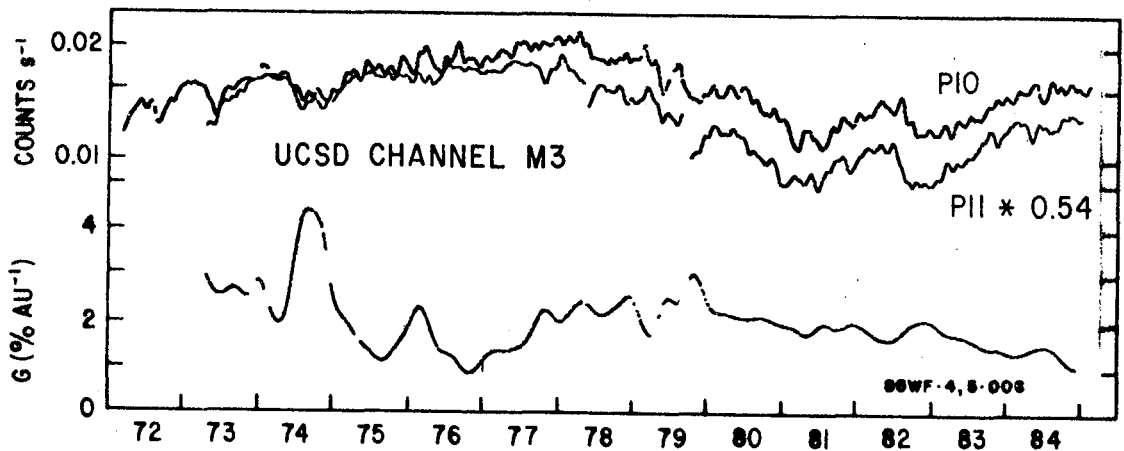
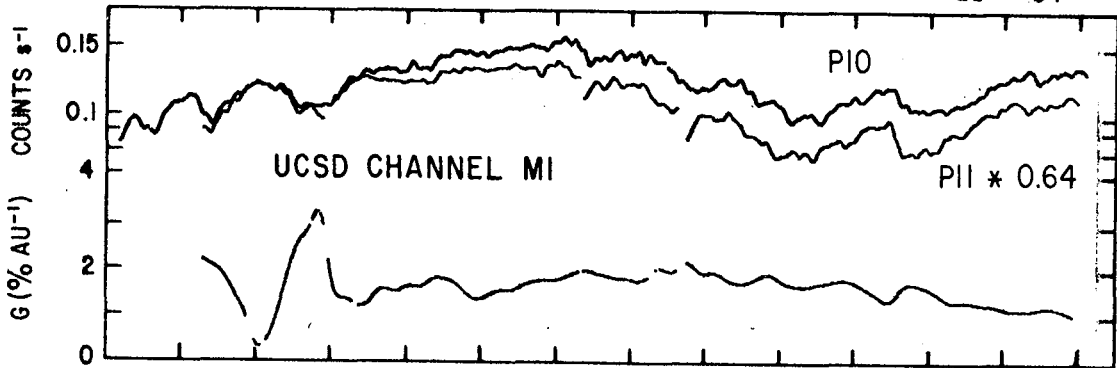
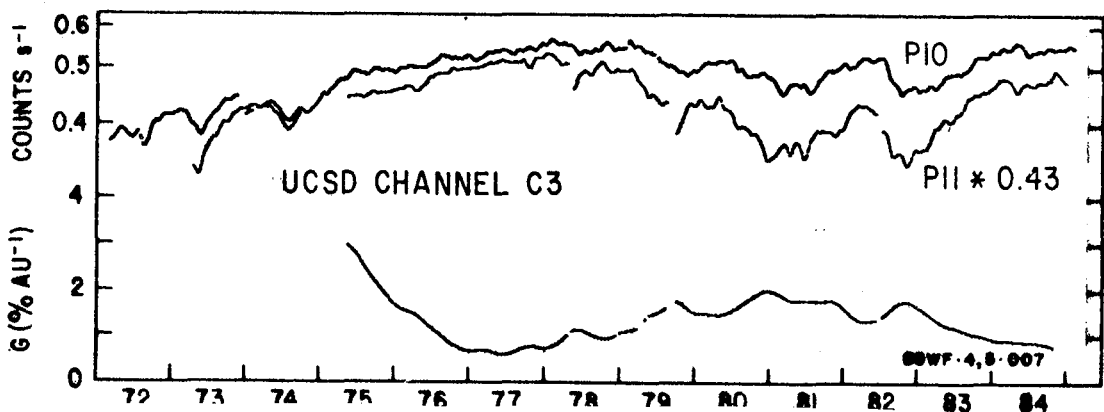
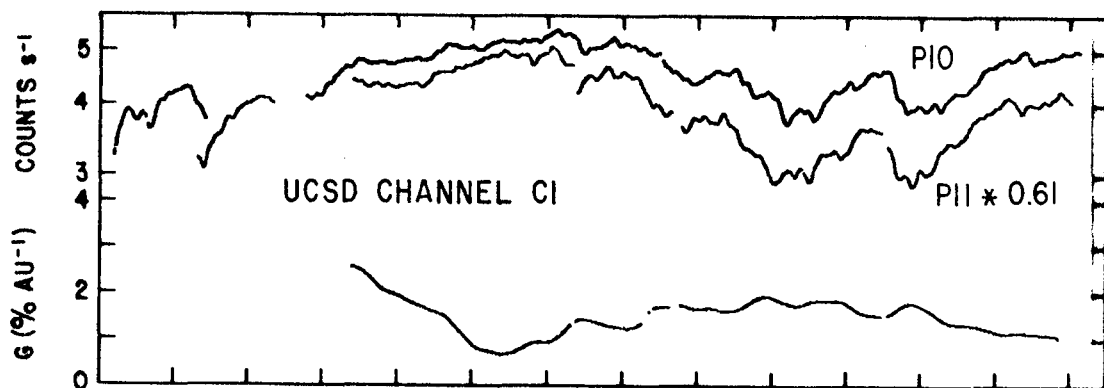


Figure 1 shows the positions of the two Pioneer spacecraft up to mid-1985..



Figures 2 and 3 show the gradient as a function of time, for each channel in Table I, calculated from normalized counting rates from the two spacecraft.. The data have been passed through a gaussian low-pass filter to smooth the graphs..

ACKNOWLEDGEMENT

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