Waveform i/o

<https://seisman.github.io/SAC_Docs_zh/basis/read-and-write/>

|  |  |
| --- | --- |
| read | r [sac] |
| Read more | rm [sac] |
|  | w [sac] |
| Write header | wh |

Plotting

|  |  |
| --- | --- |
| begin device | bd x |
| quick dirty plot off | qdp off |
| plot the data | p |
| plot multiple data in one page | p1 |
| set y-axis to be the same | ylim all |
| set x -axis related to origin time | xlim o o +8 |
| xlabel | xlabel “Time @(s@)” |
| Title | title ‘&1,KZTIME& &1,KZDATE&' |
| x/y axis label | x/ydiv power off |
| file id placement (up left -ul) | fieldid l ul |

List header information

|  |  |
| --- | --- |
| List header | lh |
| change header | ch |
| e | end time |
| B | begin time |
| a | p arrival |
| t0 | S arrival |
| Add event informations | ch [header] [value] |
|  |  |

Data manipulation

|  |  |
| --- | --- |
| Cut waveform  <https://seisman.github.io/SAC_Docs_zh/commands/cut/> | cut 0 150  r [sac]  // cut a -3 10  r [sac] |
| rotate to great circle path | **rotate** **to** gcp normal |
|  |  |
|  |  |

Filtering and spectral analysis

|  |  |
| --- | --- |
| Remove mean | rmean |
| taper | taper/ rtr |
| Filtering | |
| bandpass 2 way fourth order 2-8 Hz | Bp p 2 n 4 c 2 8 |
| highpass |  |
| lowpass |  |
| Integration |  |
| Fourier transform | fft |
| Plot spectrum | psp am |

Phase Pick

|  |  |
| --- | --- |
| use auto picker | apk |
| use manual pick | ppk |
| pick all 3 components together | ppk p 3 m on bell off |
| m/n : next/back  p/s: p/s arrival  o: zoom out  q: quit | |

SAC Debug

|  |  |
| --- | --- |
| SAC ERROR 1303: Overwrite flag is not on for file | ch lovrok true |
|  |  |

Gmt sac

SAC extension

* saclst

Usage: saclst header\_lists f file\_lists

Instrumental Response

<http://eqseis.geosc.psu.edu/cammon/HTML/Classes/AdvSeismo/iresp/iresp.html>

Details in header

|  |
| --- |
| NPTS = 2409 # number of data points  B = -9.992996e+00 # begin time  E = 1.408700e+01 # end time  IFTYPE = TIME SERIES FILE # file type  LEVEN = TRUE # evenly sampled time series  DELTA = 1.000000e-02 # time increment  IDEP = VELOCITY (NM/SEC) # physical unit of the data  DEPMIN = -2.073471e+04 # minimum amplitude  DEPMAX = 1.584818e+04 # maximum amplitude  DEPMEN = 5.137106e+01 # mean amplitude  OMARKER = 0 # event origin marker  AMARKER = 1.848 # first arrival (P) marker  T0MARKER = 3.192 # t0 (S) marker  KZDATE = NOV 20 (324), 1999 # reference date  KZTIME = 00:12:55.840 # reference time  IZTYPE = GMT DAY # type of reference time  KSTNM = BV # station name  CMPAZ = 0.000000e+00 # component azimuth relative to north  CMPINC = 0.000000e+00 # component "incidence angle" reletive to the vertical  STLA = 4.075520e+01 # station latitude  STLO = 3.101490e+01 # station longitude  STEL = 2.470000e+02 # station elevation  STDP = 0.000000e+00 # station depth below surface (meters)  EVLA = 4.079930e+01 # event latitude  EVLO = 3.100330e+01 # event longitude  EVDP = 8.150000e+00 # event depth  DIST = 4.994444e+00 # source receiver distance in km  AZ = 1.686886e+02 # azimuth  BAZ = 3.486961e+02 # back azimuth  GCARC = 4.492941e-02 # great circle distance  LOVROK = TRUE # TRUE if it is okay to overwrite this file on disk  USER7 = 0.000000e+00 # User defined time picks  USER8 = 0.000000e+00 # User defined time picks  NVHDR = 6 # Header version number. Current value is the integer 6.  SCALE = 1.000000e+00 # Multiplying scale factor for dependent variable [not currently used]  NORID = 0 # Origin ID (CSS 3.0)  NEVID = 0 # Event ID (CSS 3.0)  NWFID = 2 # Waveform ID (CSS 3.0)  LPSPOL = FALSE # TRUE if station components have a positive polarity (left-hand rule)  LCALDA = TRUE # TRUE if DIST, AZ, BAZ, and GCARC are to be calculated from station and event coordinates  KCMPNM = EPZ\_01 # Component name  MAG = 2.310000e+00 # Event magnitude |