6 Discrete Fourier analysis

Data file RSL.TXT contains 134 annual mean values (in milimeter) of relative sea level in Stockholm from 1889 to 2022. Analyse this time series by performing the following tasks:

(a) make a plot of the time series
(b) make linear regression analysis to estimate the land uplift rate in milimeter per year
(c) create a residual time series by removing the linear trend
(d) perform DFT on the residual time series
(e) calculate the amplitudes for different frequencies and make a frequency-amplitude plot.

1889	7222
1890	7288
1891	7210
1892	7242
1893	7305
1894	7267
1895	7244
1896	7233
1897	7204
1898	7300
1899	7350
1900	7192
1901	7144
1902	7203
1903	7335
1904	7200
1905	7244
1906	7242
1907	7204
1908	7135
1909	7188
1910	7188
1911	7215
1912	7209
1913	7255
1914	7204
1915	7139
1916	7170
1917	7149
1918	7145
1919	7119
1920	7111
1921	7220
1922	7178
1923	7203
1924	7118
1925	7191
1926	7117
1927	7172
1928	7132
1929	7106
1930	7095
1931	7097
1932	7141
1933	7032
1934	7108
1935	7136
1936	7059
1937	7006
1938	7152
1939	6975
1940	7018
1941	6939
1942	7020

1943	7142
1944	7098
1945	7099
1946	7037
1947	6926
1948	7086
1949	7120
1950	7086
1951	6943
1952	7079
1953	7046
1954	7000
1955	7046
1956	7029
1957	7046
1958	6994
1959	6936
1960	6900
1961	7084
1962	7038
1963	6892
1964	6967
1965	6958
1966	6938
1967	7079
1968	6928
1969	6887
1970	6930
1971	6962
1972	6873
1973	6996
1974	6946
1975	6943
1976	6861
1977	6899
1978	6889
1979	6875
1980	6861
1981	6989
1982	6902
1983	7014
1984	6875
1985	6873
1986	6896
1987	6854
1988	6920
1989	7006
1990	7009
1991	6855
1992	6905
1993	6832
1994	6855
1995	6906
1996	6705

1997	6844
1998	6902
1999	6856
2000	6879
2001	6831
2002	6805
2003	6804
2004	6880
2005	6849
2006	6813
2007	6954
2008	6901
2009	6785
2010	6752
2011	6856
2012	6891
2013	6757
2014	6733
2015	6896
2016	6784
2017	6896
2018	6731
2019	6814
2020	6905
2021	6792
2022	6823