Jones et al. 1985

$$\dot{A} = 2DB - A,$$
$$\dot{B} = \mathrm{i}\,A - \tfrac{1}{2}\mathrm{i}\,A^*\omega - B,$$
$$\dot{\omega} = -\mathrm{i}\,AB - \nu\omega,$$

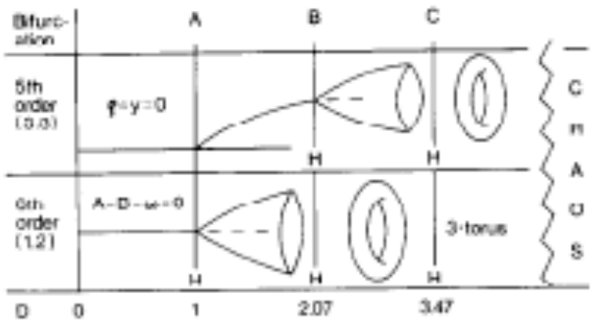
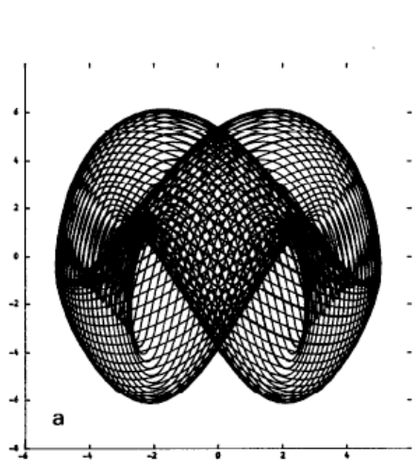


Fig. 5. Schematic bifurcation diagrams for the fifth and sixth order systems with $\sigma = 1$, $\nu = 0.5$. Hopf bifurcations are indicated by the letter H.



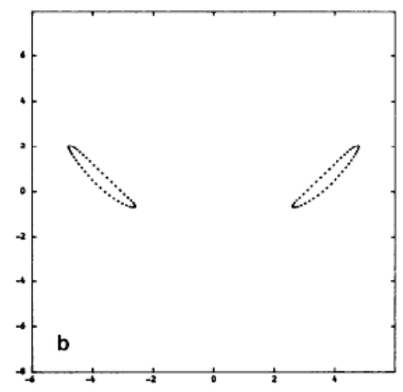
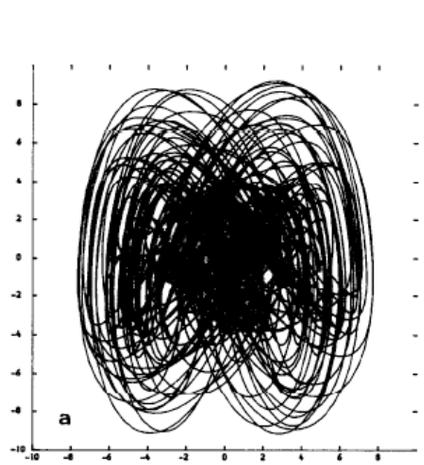


Fig. 1. a) A projection of a trajectory for the sixth order system (1.1) with $\sigma = 1$, $\nu = \frac{1}{2}$ and $D = 3.0$. The projection is onto the $B_r\omega_r$-plane. b) The Poincaré map for the same plane as in a), taking the section $A_r = 0$.



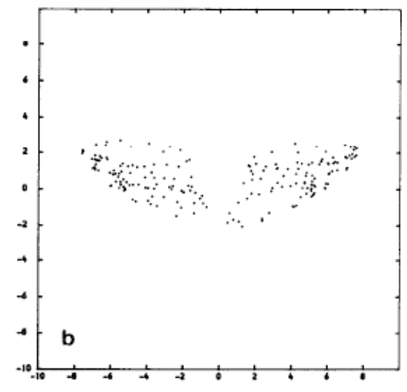
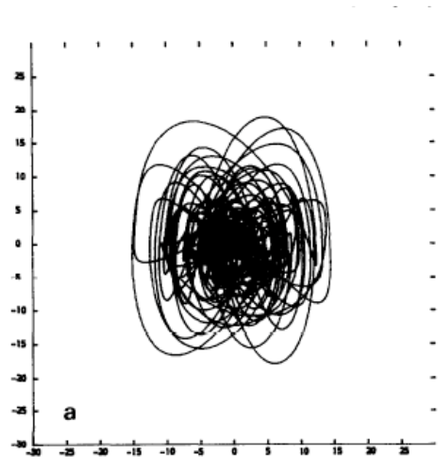


Fig. 2. a) As for 1a, but with $D = 3.6$; b) As for 1b, but with $D = 3.6$.



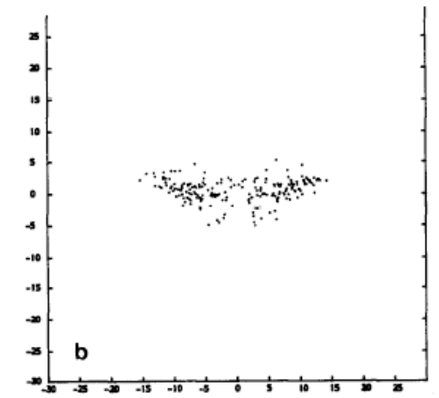
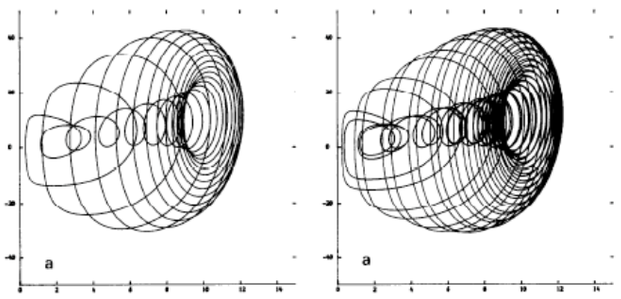


Fig. 3. a) As for 1a, but with $D = 8.0$; b) As for 1b, but with $D = 8.0$.



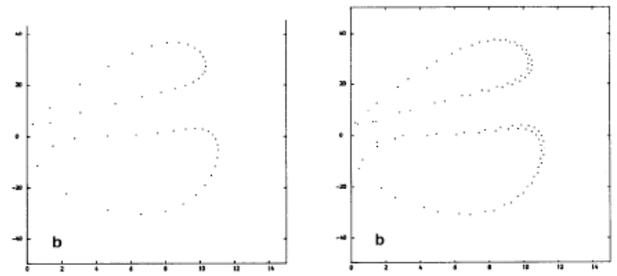
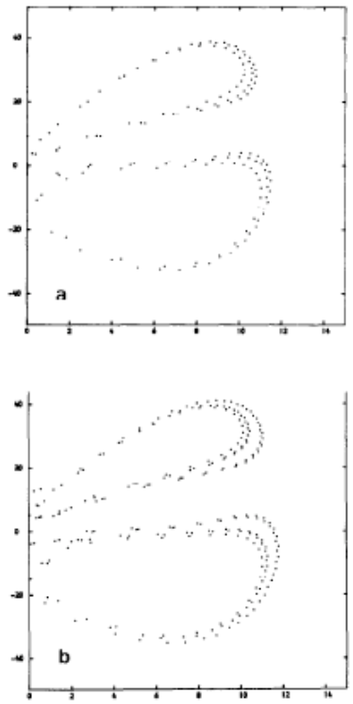


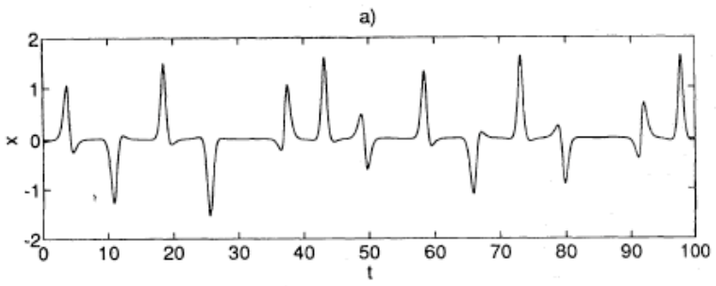
Fig. 11. a) As for 9a, but with $D = 3.80$. The frequency is now locked on a 25:1 ratio; b) The Poincaré map corresponding to 11a.

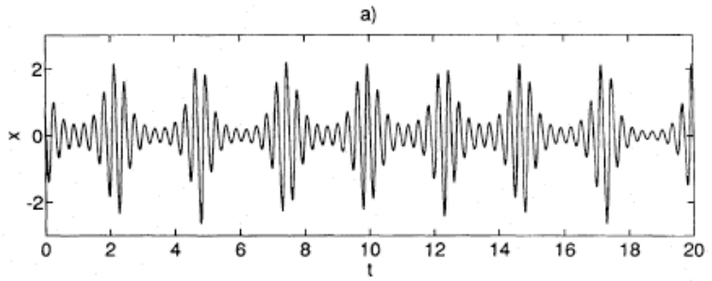
Fig. 12. a) As for 9a, but with $D = 3.82$. The first period-doubling bifurcation has now occurred; b) The Poincaré map corresponding to a).

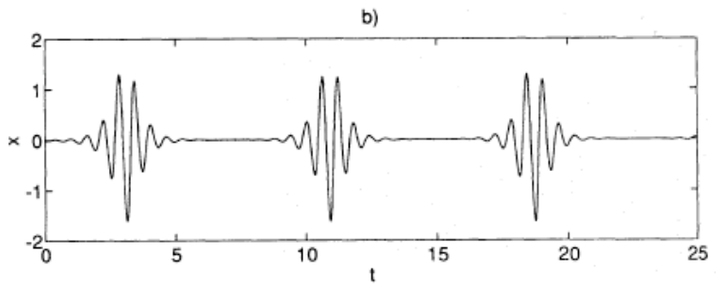


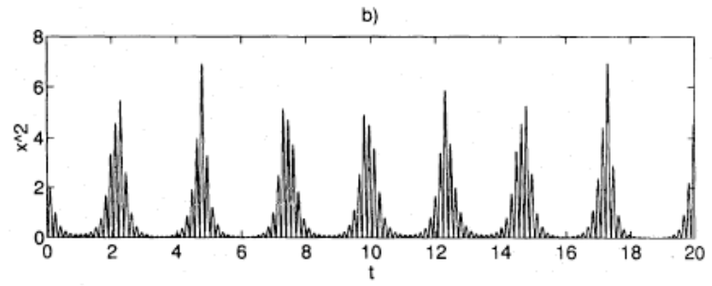
Tobias et al. 1995

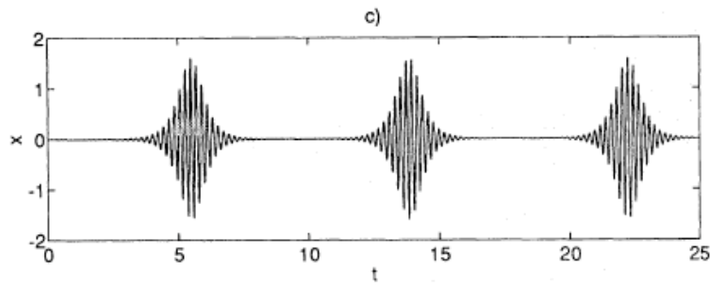
$$\dot{r} = \lambda r + a\,zr + d\,r^2 z\,\cos\phi,$$
$$\dot{\phi} = \omega - d\,rz\,\sin\phi,$$
$$\dot{z} = \mu - z^2 - r^2 + cz^3.$$

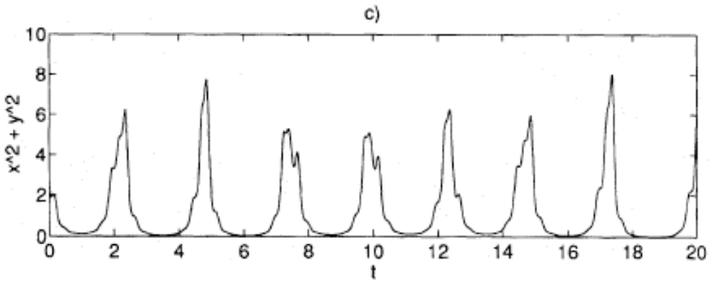


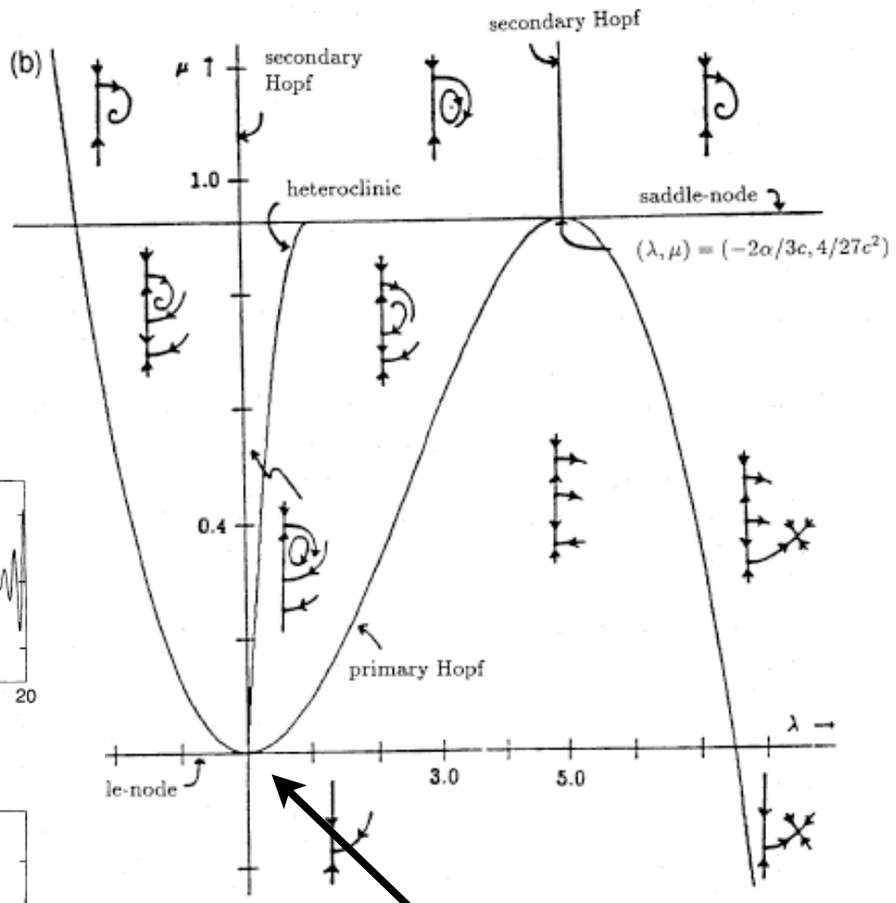


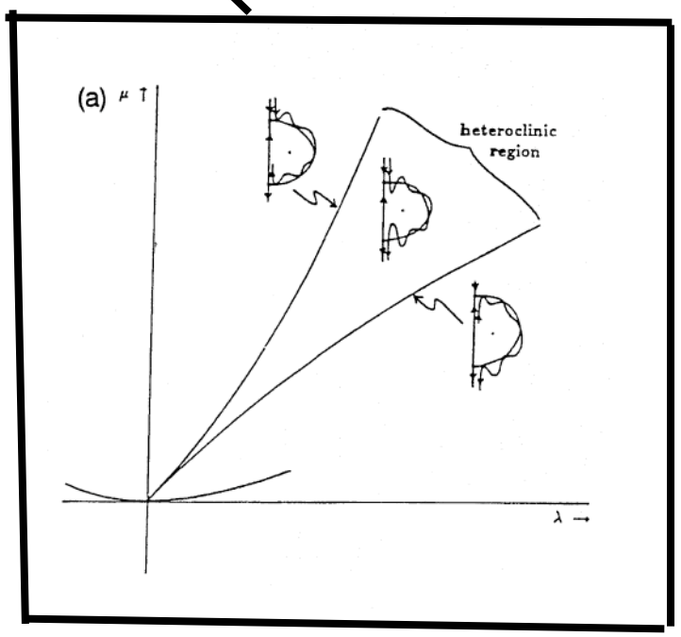








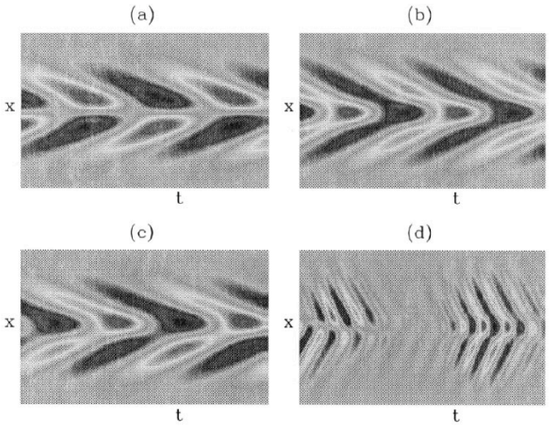


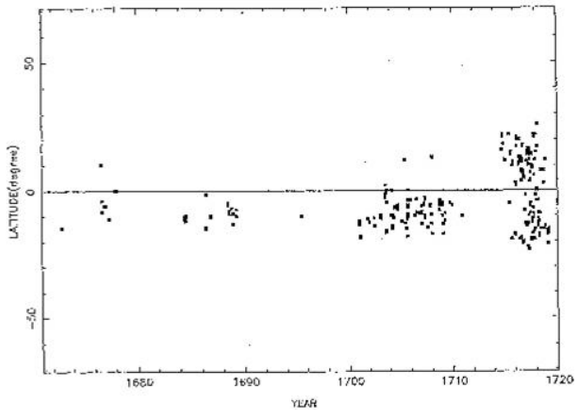


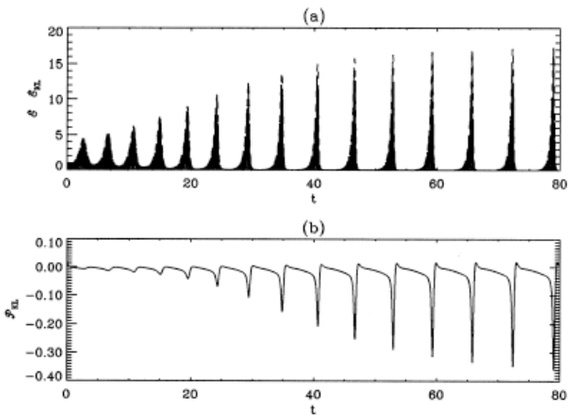
Knobloch et al. 1998

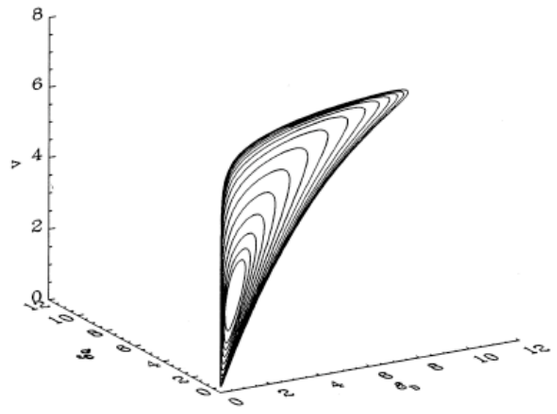
$$\dot{z}_1 = (\mu + \sigma + \mathrm{i}\omega_1)\, z_1 + a\,|z_1|^2 z_1 + b\,|z_2|^2 z_1 + c\, z_2^2 \overline{z}_1,$$
$$+ (\epsilon v + \delta v^2 + \kappa w^2)\, z_1 + (\beta + \gamma v)\, w z_2,$$

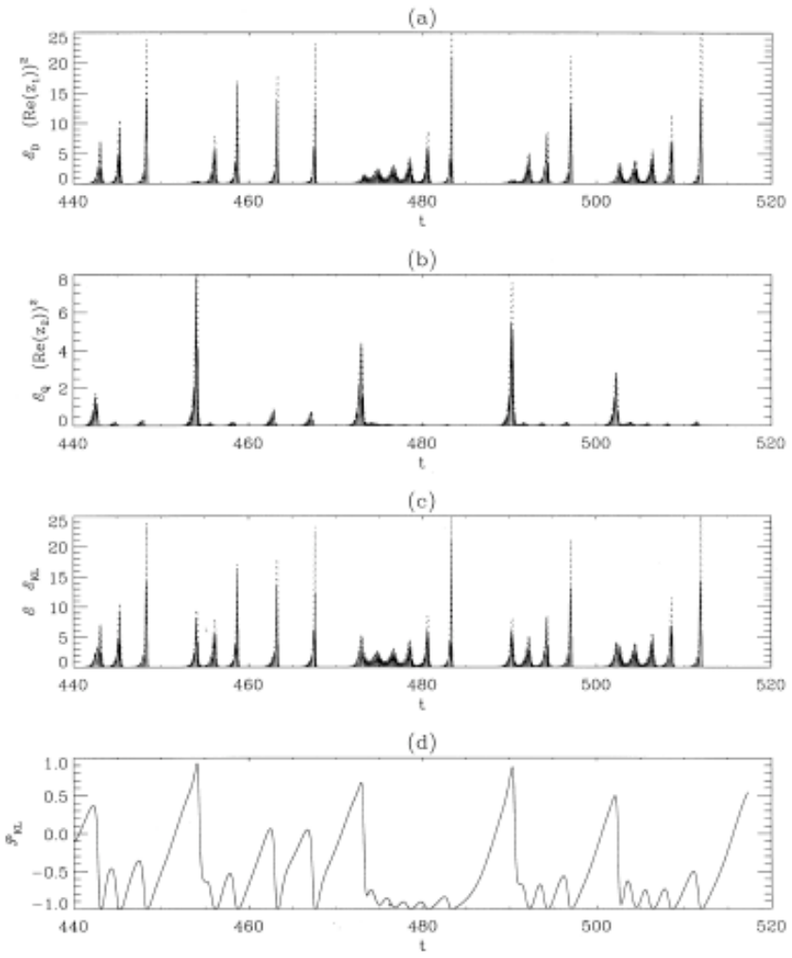
$$\dot{z}_2 = (\mu + \mathrm{i}\omega_2)\, z_2 + a'\,|z_2|^2 z_2 + b'\,|z_1|^2 z_2 + c'\, z_1^2 \overline{z}_2$$
$$+ (\epsilon' v + \delta' v^2 + \kappa' w^2)\, z_2 + (\beta' + \gamma' v)\, w z_1,$$
$$\dot{v} = -\tau_1 v + e_1\,(|z_1|^2 + |z_2|^2),$$
$$\dot{w} = -\tau_2 w + e_2\,(z_1 \overline{z}_2 + z_2 \overline{z}_1).$$

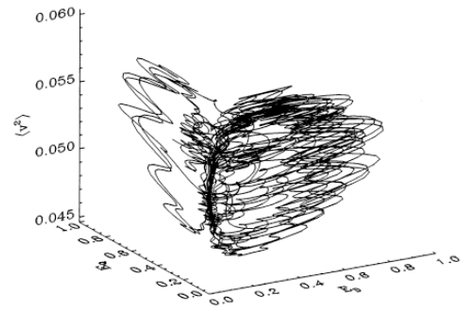


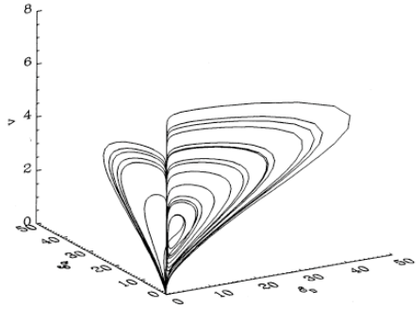


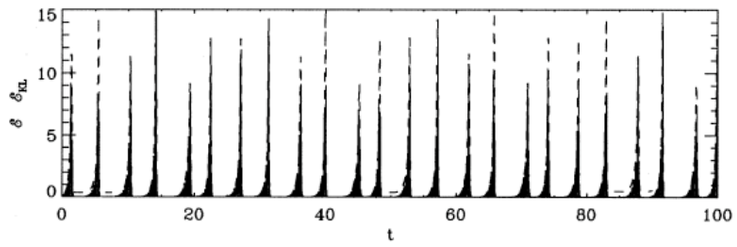


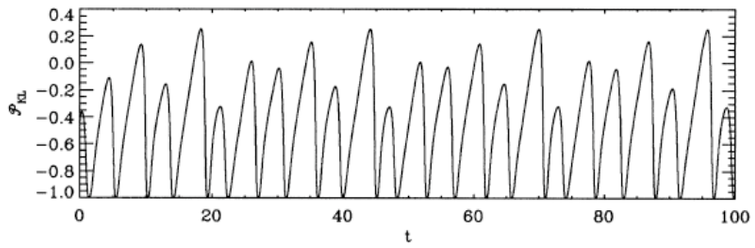












Melbourne et al. 2001

$$
\begin{aligned}
\dot{z}_1 &= (\mu_1 + \mathrm{i}\omega) z_1 - |z_1|^2 z_1 - \frac{c_2 + \mu_1}{\mu_2} x_2^2 z_1 + \frac{e_3 - \mu_1}{\mu_3} x_3^2 z_1 \\
&\quad + \epsilon_1 \bar{z}_1^5 + \epsilon_2 |z_1|^4 x_2 + \epsilon_3 z_1 x_2 x_3^3 , \\
\dot{x}_2 &= \mu_2 x_2 - x_2^3 - \frac{c_3 + \mu_2}{\mu_3} x_3^2 x_2 + \frac{e_1 - \mu_2}{\mu_1} |z_1|^2 x_2 \\
&\quad + \epsilon_1 \,\mathrm{Re}(z_1^3)\, x_2^2 + \epsilon_2 x_1^5 + \epsilon_3 x_3^5 , \\
\dot{x}_3 &= \mu_3 x_3 - x_3^3 - \frac{c_1 + \mu_3}{\mu_1} |z_1|^2 x_3 + \frac{e_2 - \mu_3}{\mu_2} x_2^2 x_3 \\
&\quad + \epsilon_1 \,\mathrm{Re}(z_1^3)\, x_2 x_3 + \epsilon_2 x_1^3 x_2 x_3 + \epsilon_3 x_2^5 ,
\end{aligned}
$$

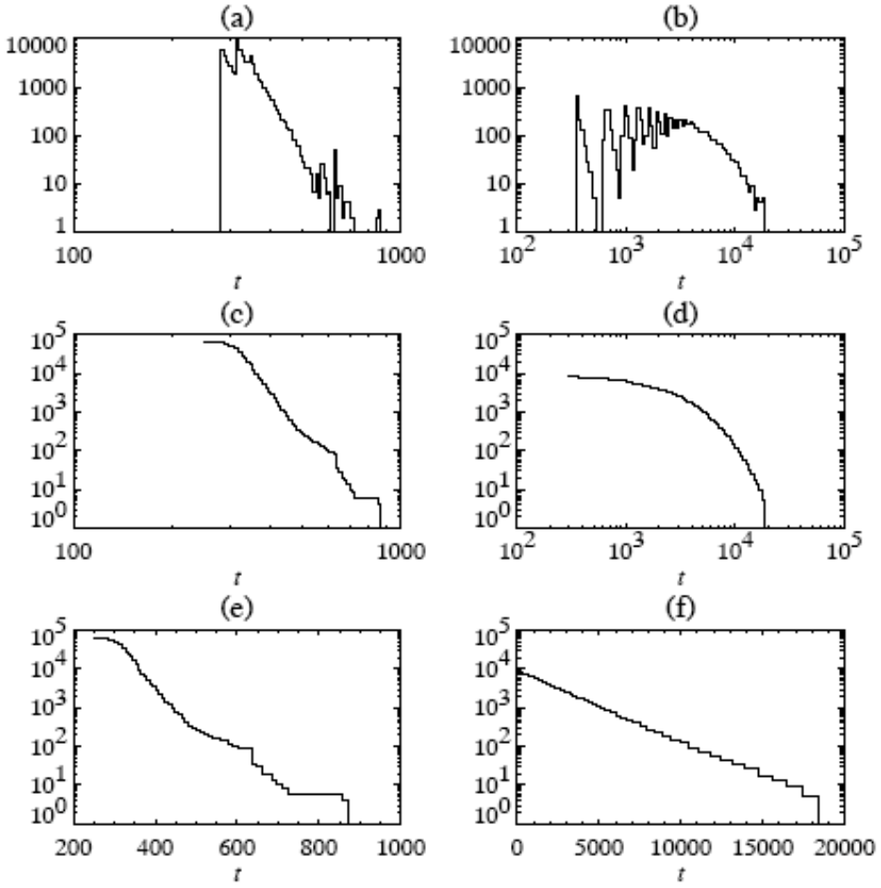


Figure 2. Distributions of durations of (a,c,e) excursions and (b,d,f) reversals. (a,b) histograms. (c,d) cumulative plot (log–log). (e,f) cumulative plot (log–linear).

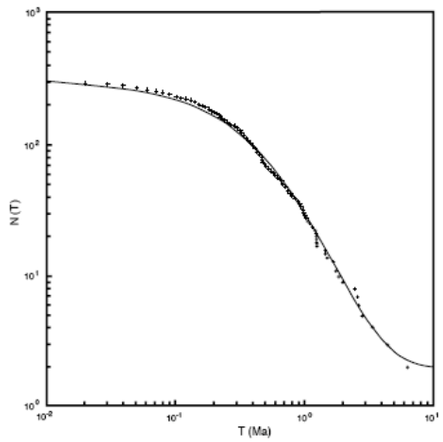


Figure 3. Distribution of reversal durations: cumulative plot (log–log) for the geomagnetic field (reproduced from [1]). Compare with figure 2(d).

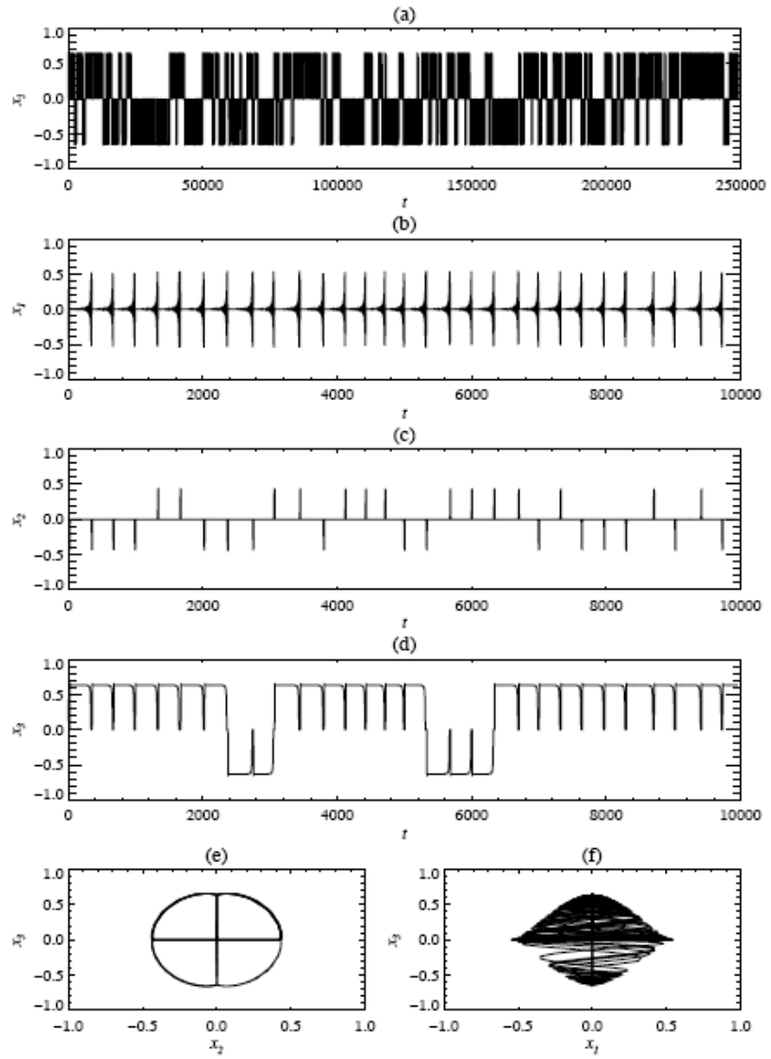


Figure 1. Behaviour of (6–8) for the parameters given in the text. (a) shows a long time series for the dipole mode x_3, and (b–d) show the x_1, x_2 and x_3 evolution in the first part of the time series. (e–f) show phase portraits: (e) x_3 vs. x_2 (f) x_3 vs. x_1.

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