Conservative, dissipative and non-twist standard maps

Appendix to the course
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Outline

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Conservative Standard Map

It is described by the equations:

$$\begin{aligned} y' &= y + \varepsilon f(x) \qquad\qquad y \in \mathbb{R}\,,\ x \in \mathbb{T} \\ x' &= x + y'\,, \end{aligned}$$

with $\varepsilon > 0$ *perturbing parameter*, $f = f(x)$ analytic function.

- Classical (Chirikov) standard map: $f(x) = \sin x$ in an equivalent notation:

$$\begin{aligned} y_{j+1} &= y_j + \varepsilon \sin(x_j) \\ x_{j+1} &= x_j + y_{j+1} = x_j + y_j + \varepsilon \sin(x_j) \qquad \text{for } j \geq 0\,. \end{aligned}$$

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Dissipative Standard Map:

It is described by the equations:

$$\begin{aligned} y' &= \lambda y + \mu + \varepsilon\, g(x) \qquad && y \in \mathbb{R}\,,\ x \in \mathbb{T} \\ x' &= x + y'\,, && \lambda, \mu, \varepsilon \in \mathbb{R}\,, \quad \varepsilon \geq 0\,, \end{aligned}$$

$0 < \lambda < 1$ dissipative parameter, μ is called the drift parameter.

Outline

Non-twist standard map

- It is described by the equations:

$$\begin{aligned} y' &= y + \varepsilon \sin(x) \\ x' &= x + a(1 - y'^2) \end{aligned}$$

for $\varepsilon \in \mathbb{R}$, $a \in \mathbb{R}$.

Outline

Programs

The following programs have been written by people attending the course.

- "StandMapIacopoLongo.m" is a MATLAB program by Iacopo Longo, showing graphs of the conservative, dissipative, non-twist maps for different values of ε.
- "StandardMapFernandoFernandezSanchez.m" is a MATLAB program by Fernando Fernandez Sanchez showing the conservative standard map up to very high values of ε.
- "StandardmapMarcJorba.rar" contains C programs by Marc Jorba on the conservative and dissipative standard maps.
- "StandardMapGladstonDuarteFerreira.c" is a C program by Gladston Duarte Ferreira on the conservative, dissipative, non-twist maps.