On k-polycosymplectic Marsden-Weinstein reductions

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This talk is divided into two parts. In the first part, I will focus on the introduction of a k-polycosymplectic manifold $(M, \boldsymbol{\omega}, \boldsymbol{\tau})$, where $\boldsymbol{\omega} \in \Omega^2(M, \mathbb{R}^k)$ and $\boldsymbol{\tau} \in \Omega^1(M, \mathbb{R}^k)$ are closed and satisfy that $\operatorname{rank}(\ker \boldsymbol{\omega}) = k$ and $\ker \boldsymbol{\omega} \cap \ker \boldsymbol{\tau} = 0$. I will define k-polycosymplectic momentum maps and discuss a Marsden-Weinstein reduction of k-polycosymplectic manifolds. This will solve a problem that has been open for over a decade. I will show that k-polycosymplectic geometry can be studied as a special case of k-polysymplectic geometry. In particular, I will describe some improvements to the k-polysymplectic Marsden-Weinstein reduction and discuss recent alternative approaches to our k-polycosymplectic Marsden-Weinstein reduction.

In the second part, the main one of this talk, I will focus on a Marsden–Weinstein reduction from a k-cosymplectic to an ℓ-cosymplectic manifold. This reduction is relevant since it involves the geometric elimination of space-time variables in field theories. I will restrict to the study of a canonical k-cosymplectic manifold $(M_k = \mathbb{R}^k \times \bigoplus_{\alpha=1}^k TQ, \boldsymbol{\tau}_k, \boldsymbol{\omega}_k)$. As an example, I will apply our techniques to a vibrating membrane with an exterior force that depends only on the radial distance.