数学与系统科学研究院

计算数学所学术报告

报告人：　**Prof. Manuel Manas**

（**Universidad Complutense, Spain**）

报告题目：

Multiple orthogonal polynomials of mixed type: Gauss-Borel factorization and the multi-component 2D Toda hierarchy

邀请人：　胡星标研究员

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报告地点：　科技综合楼三层 **311**

计算数学所报告厅

Abstract:

Multiple orthogonality is considered in the realm of a Gauss--Borel factorization problem for a semi-infinite moment matrix. Perfect combinations of weights and a finite Borel measure are constructed in terms of M-Nikishin systems. These perfect combinations ensure that the problem of mixed multiple orthogonality has a unique solution, that can be obtained from the solution of a Gauss--Borel factorization problem for a semi-infinite matrix, which plays the role of a moment matrix. This leads to sequences of multiple orthogonal polynomials, their duals and second kind functions. It also gives the corresponding linear forms that are bi-orthogonal to the dual linear forms. Expressions for these objects in terms of determinants from the moment matrix are given, recursion relations are found, which imply a multi-diagonal Jacobi type matrix with snake shape, and results like the ABC theorem or the Christoffel--Darboux formula are re-derived in this context (using the factorization problem and the generalized Hankel symmetry of the moment matrix).

The connection between this description of multiple orthogonality and the multi-component 2D Toda hierarchy, which can be also understood and studied through a Gauss--Borel factorization problem, is discussed. Deformations of the weights, natural for M-Nikishin systems, are considered and the correspondence with solutions to the integrable hierarchy, represented as a collection of Lax equations, is explored. Corresponding Lax and Zakharov--Shabat matrices as well as wave functions and their adjoints are determined. The construction of discrete flows is discussed in terms of Miwa transformations which involve Darboux transformations for the multiple orthogonality conditions. The bilinear equations are derived and the τ-function representation of the multiple orthogonality is given.

欢迎大家参加！