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**M Apagodu\*** (mapagodu@vcu.edu), 1015 Floyd Avenue, Richmond, VA 23284, and **D Zeilberger**. *Extending the Chen-Hou-Zeilberger method for automatic discovery of Congruence Theorems for Combinatorial Sequences from Single Sums to Multiple Sums*. Preliminary report.

Bill Chen, Qing-Hu Hou and Doron Zeilberger have recently developed an efficient algorithm for discovering, and proving, congruence theorems, modulo primes, of indefinite (single) sums of combinatorial sequences that (like the Central Binomial, Catalan, and Motzkin numbers) may be defined as constant terms of powers of Laurent polynomials of a single variable. They also proved a general theorem linking them to C-finite sequences. In the present work, we extend this work in two directions. Instead of only single summation, we consider multiple summation, and instead of combinatorial sequences defined as constant terms of powers of Laurent polynomials of a single variable, we can handle Laurent polynomials of several variables. We also extend the above theorem where C-finite sequences give way to Holonomic sequences. An important tool is the Apagodu-Zeilberger multi-variable extension of the Almkvist-Zeilberger algorithm. (Received December 29, 2015)