Year: 2017 | **Vol.: 91** | **Fasc.: 1-2**

Title: Ordinal sums of binary conjunctive operations based on the product

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We discuss several types of ordinal sums for conjunctive operations for an infinite set of truth values (modeled by the real unit interval). In some cases, they can be seen as both a construction method and a representation (for example, when considering copulas), this is no more true for the product-based ordinal sums when considering quasi-copulas or semicopulas. For each of the three product-based ordinal sums discussed here, we characterize the smallest set of conjunctive operations containing all quasi-copulas and for which the considered ordinal sum is both a construction method and a representation. In particular, the set of all Lipschitz conjunctive operations is the smallest superclass of the set of quasi-copulas for which all three product-based ordinal sums under consideration are a construction method and a representation.

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