Fuzzy rough sets, fuzzy preorders and fuzzy topologies

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The relationship between rough set theory and topological spaces is well-known. One central observation in such studies is as follows.

Given an arbitrary relation R on a nonempty set X, putting $\overline{R}(A) = \{x : (x, y) \in R$, for some $y \in A\}, A \subseteq X$, defines a Kuratowski saturated closure operator $\overline{R}$ on X iff R is a preorder, i.e., R is reflexive and transitive (a Kuratowski closure operator $k : 2^X \to 2^X$ on X is called saturated if k satisfies $k(\cup A_j) = \cup k(A_j), A_j \subseteq X, j \in J$, in place of the usual requirement $k(A_1 \cup A_2) = k(A_1) \cup k(A_2), A_1, A_2 \subseteq X$).

The counterpart of above situation has been investigated for fuzzy rough sets (a notion which is formulated in terms of a *fuzzy* relation on a set), which brings to the fore of the relationship between fuzzy preorders and fuzzy topologies. Such relationship were characterized differently by a number of authors. In this talk, I will discuss about such different characterizations and possible relationships among them.