Report on J. Borwein and B. Sims, "The Douglas-Rachford Algorithm in the Absence of Convexity"

The authors study the behaviour of the Douglas-Rachford algorithm for finding the intersection of two sets in the instance when one of two sets is a line, or a line segment, and the other set is a ring. For this example, the iterates of the Douglas Rachford algorithm can be written as steps in a diffence equation, leading to an analysis of the the Douglas-Rachford algorithm as a dynamical system. Specific comments follow.

1. document was not compiled enough to synchronize references, so I am not certain that these are consistent or complete.
2. Spelling errors throughout (e.g. Spiralling, waek, Spltting, Ratchford).
3. p3 l+13: It seems that an opportunity is lost to at least mention one large "pathology" of nonconvex projections by excluding the point $x = 0$ from the discussion, i.e. single-valuedness of the projectors. Perhaps a very brief mention that by excluding the origin you are ensuring that the projector and reflector corresponding to the circle/sphere is single-valued? Also, by excluding the origin from the discussion, you are excluding all initial points whose iterates pass through the origin (item below).
4. p4. Remark 1: "divide-and-concurr", though not so named by its inventor, is due to Pierra. Citation [9] should be replaced by author = G. Pierra,
   title = Eclatement de contraintes en parallèle pour la minimisation d'une forme quadratique,
   journal = Lecture Notes in Computer Science,
   publisher = Springer Verlag,
   address = New York,
   year = 1976,
   volume = 41,
   pages = 200-218
   Elser "repackaged" it in [9], but the idea is well established and common practice in the mathematics literature.
5. p5, Example 1: I do not really understand the point of this example. Averaged reflections were never under consideration.
6. p6, Fig.3: the points do not match the description – the very first move, if really a reflection across the line segment, would be in a direction northwest from the initial point with midpoint at the right endpoint of the linesegment. Similarly with the third move. It appears that the algorithm thinks it's working on a line, not a line segment.

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7. p6, Fig.3: Why show alternating reflections? It is known that this does not converge even in the convex case. Averaging, or the addition of a Krasnoselski-Mann relaxation, is important for restoring firm nonexpansiveness of the fixed point mapping in the convex case.
8. p8, Theorem 1: should f be a mapping from $N \times \mathbb{R}^n \to \mathbb{R}^n$ instead of $\mathbb{R}^m$?
9. p8, Theorem 1: if you use n for the dimension of the domain and range, please use a different index for the iterate (instead of n). used m
10. p9, l+2, $T_y^t(x)$: This is the first time this notation is used, and it doesn't match $T_{S,L}$ very well. Consider an alternative notation?