We are grateful to the referee for a very careful and thorough reading (more careful than our own in places, we have to confess) and have added our thanks in the Acknowledgements. Our responses are embedded below.

Scientific Editor's Comments:

The two radio galaxies should be named in the abstract. I recommend including the B2 prefix and the UGC/NGC names as well.

We have added the names to the first sentence of the Abstract.

Reviewer's Comments:

The manuscript entitled "Relativistic jet models for two low-luminosity radio galaxies: evidence for backflow?" represents one more step in the series of papers in which the authors have been involved within a long-term effort to understand the physics of FRI jets. After checking the manuscript in detail, I think that it is suitable for publication after the authors review some minor issues, listed below, related with figures and/or clarification of some aspects of the paper.

- In the fourth page, second column, lines 21/22, the authors stress that the spectral index of the jets, α_j, must be constant and known to scale the result of the subtraction correctly. In general, I understand that the spectral index increases with distance due to losses. How good is the approximation of constant α_j for the jet in the region? Can the authors provide values that confirm this point in the studied region?

The approximation is a good one. We now quote the total variations over the modelled regions from the interpolated subtractions immediately after giving the integrated values:

"Variations across the modelled regions are small, with $0.50 \leq \alpha_{\rm j} \leq 0.62$ in both sources."

In fact, the spectrum flattens slightly with increasing distance from the nucleus, contrary to what one might expect from synchrotron losses. There must be ongoing particle acceleration to explain the observed X-ray emission and the break frequency is far above the radio band. We do not think it is relevant to elaborate on this topic here, but we plan to address it in detail in a subsequent paper. Note also that we use the interpolated subtractions for final modelling, which are not affected by this issue. Nevertheless, if there had been large variations in spectral index, those would also have violated our assumptions for the calculation of synchrotron emission, so we mention this in Section 3.1.

- A general comment for the figures: Regardless of the scale given in one of the frames in each figure, I found it sometimes difficult to follow the discussion in the text regarding distances between the different features and the core due to the lack of tickmarks in the contour of the figures. The authors should consider adding them.

We strongly prefer not to add tick marks to the montages as these figures are already rather squashed, and adding labels around the edges of the plots would force us to even smaller scales and add complexity to already crowded figures. We feel that providing the angular scales as bars or as axes on the profile plots is sufficient for our purpose.

We have, however, added scale bars to Figs 7(e), 9 and 13 and we have labelled some features which might be difficult to identify on the figures without guidance: the limb-brightening of the 0206+35 counter-jet (in Figure 6a), the arc and bar in 0755+37 (in Figure 10a) and the field transition points for both sources (in Figs 7a and 7d). We hope that these changes deal with the basic issue noted by the referee, perhaps in a neater way than the addition of tick marks.

- In Figure 6, the color scale does not allow to distinguish the region where I_j/I_cj is smaller than one. Perhaps a logarithmic scale would be better for this purpose.

The white contours on the sidedness images represent I_j/I_cj = 1 but we omitted to mention this in the captions of Fig.6 and Fig.10. We have corrected this omission and have changed to a logarithmic transfer function as suggested by the referee. The logarithmic transfer function indeed gives slightly better discrimination between levels where I_j/I_cj < 1.

- In Figure 8, the left column of figures may have the wrong label, as the authors say in the text that it shows the different parameters versus the angle from the axis. This is mentioned in page 11, lines 5-10. Here the authors should specify to which distances they refer when writing "Close to the nucleus" and "Farther out".

The labels are correct. The reason for the possible confusion is that we do not plot radial averages for 0206+35: it only makes sense to plot averages where the brightness and polarization vary fairly slowly with distance from the nucleus. For 0206+35, this holds only after recollimation, which is why we plot only against distance from the axis. We have clarified this point in Section 4.1, point (viii) where we now say:

"Averaged transverse profiles of total intensity, I, sidedness ratio $I_{\rm j}/I_{\rm cj}$, and Q/I over selected regions where the brightness and polarization distributions vary slowly with distance from the nucleus."

and also refer explicitly to the outer and flaring regions rather than "Close to the nucleus" and "Farther out".

- In Figure 10, panel k, the label of the y-axis, does not correspond to I_j/I_cj, as the caption reads.

The panel is correct, but the caption was wrong (the profiles are of I). We have corrected this.

- In Figure 11, the caption does not correspond with the figure.

The caption was indeed from an earlier version of the figure without high-resolution panels. We have rewritten it.

- In page 15, first column, item (xii), a reference to the corresponding figure is missed (figs. 12 m-t).

Added.

- In page 15, first column, lines 55 to 58 seem to include a certain level of interpretation of the results that collides with the descriptive nature of the section. I don't know whether this text should be placed somewhere else or rephrased, I leave it to the authors' decision.

Indeed, this sits better in 5.3, where we already refer to the limb-brightening. We have removed the sentences "This is consistent .... features." and rewritten the part of Section 5.3 dealing with the transverse emissivity profile in the outflow to say:

"The observed limb-brightening in both sources shows side-to-side symmetry. This cannot result from a transverse velocity gradient in the sense we have inferred, which would lead to limb-brightening only in the counter-jet. In agreement with this qualitative argument, the best-fitting transverse emissivity profiles are higher at the edges than on-axis. This effect is slight in 0206+35, where the profile is consistent with a uniformly-filled cylinder everywhere. In 0755+37, however, limb-brightening is required over much of the outer region (Fig.~\ref{fig:emiss}b). As noted in Section~\ref{0755fit}, the observed transverse intensity profiles in this source are significantly more limb-brightened than the model predicts, suggesting that there is a narrow enhancement in emissivity at the boundary between the outflow and backflow. The functional form we assume for the transverse variation of emissivity does not allow for such narrow features."

- In page 15, second column, line 44, the third item reads that "The inner bar ... is both straighter and slightly farther from the nucleus than in the observed image...". Panel d in Figure 10 seems to

indicate that the inner bar is closer to the nucleus in the model
than in the image.

The word "than" was wrong and has been removed.

In this same item, a reference to the corresponding figure is missed
(figs. 10 a, b, d).

We have added this reference.

- In page 18, section 6.2, the first lines affirm that the plumes and tails in FRI sources are buoyant. I have the feeling that those outflows could still be far from buoyant. Certainly subsonic, but with velocities considerably larger than those required by the motion of the gas to be dominated by pure buoyancy. I imagine it is difficult to provide any measure of the velocities of the flow in those regions and compare them with the expected buoyancy velocities in a typical galactic atmosphere. If this aspect cannot be supported by any previous work, I would suggest to modify the sentence accordingly.

Our use of "buoyant" was only meant to apply to plumes, but as the buoyancy (or otherwise) of the flow is not important to our argument, we have deleted the word from the first sentence of the section.

- The last sentences of the first paragraph in Section 6.2 could be supported by a reference to the simulations by Perucho & Marti (2007), which is cited in the paper. In these simulations, it is possible to observe the formation of a cocoon without any region that can be related to a hot spot.

Agreed. We have added a sentence citing Perucho & Marti and Rossi et al. (2008).

- In this first and the next paragraph of section 6.2, the authors refer to FRII sources. Can the authors comment on the possibility to detect such backflows in FRII lobes? From the discussion I got the impression that it should be easier to observe the expected asymmetries produced by the presence of backflows in such objects. Why not then checking the hypothesis observing FRII sources?

This is a very interesting point, but one which is outside the scope of the present paper. There are rather few observations of FRII sources comparable in depth and resolution to those we have used in our FRI studies and current simulations do not offer much of a guide as to what we might expect. We have added a paragraph to the "Further work" section to acknowledge that this is an interesting topics to pursue in the future.

- In the footnote associated to the last paragraph of section 6.2, the authors state that the backflow observed in the simulation by Perucho & Marti could be affected by the open boundary condition and to the use of axisymmetric geometry. In the paper by Saxton et al. that is cited to support this affirmation, evidence can be found for the first effect (open versus reflecting boundary), but not for the second (axisymmetry). Actually, all the simulations in Saxton et al. are axisymmetric. Could the authors provide a reference to support this second aspect or give an explanation?

The references we originally had in mind were Norman (1996) and Aloy et al. (1999), now both cited. However, the comment prompted us to review the relevant literature at slightly greater length, and we discuss the work by Rossi et al. (2008; relativistic and 3D) in more detail along with that of Perucho and Marti. We now emphasise that the key ingredient for the sort of backflow we need is a relativistic flow which is much lighter than its surroundings. The paragraph in question now reads:

"There is therefore both theoretical and observational support for supposing that jet outflows containing relativistic particles and magnetic fields may be redirected through large angles in lobed FR\,I sources. The additional ingredient suggested by our modelling of 0206+35 and 0755+37 is that a component of such an outflow in an FR\,I source can return to the vicinity of the AGN as mildly relativistic backflow. As we noted in the introduction to this paper, this idea is supported by the presence of backflow with $\beta \ga 0.2$ around the jets in some numerical simulations of the propagation of light, relativistic jets. The simulation by \citet{PM07} used initial conditions for the jet derived from our FR\,I source models \citep{LB02a,LB02b} and realistic density and pressure gradients in the surrounding galactic and group atmosphere \citep{Hard02}. In particular, the velocity at injection was $\beta = 0.87$ and the initial density contrast (the ratio of the density of the jet to that of its surroundings) was $\eta = 10^{-5}$. Although the jet had propagated only $\approx$15\,kpc by the end of the simulation, the structure already resembled a lobed FR\,I source of the type discussed here, with a cocoon of backflowing, mixed jet and external plasma surrounding the jet. The jet was transonic at its termination, so no hot spot was formed. Typical backflow velocities in the cocoon were $\beta \approx 0.15$, with values reaching $\beta \approx 0.4$ close to the nucleus. The use of an open boundary condition in the symmetry plane at the base of the jet can cause the backflow speed to be over-estimated \citep{Saxton02}, although \citet{PM07} argued that this effect was small in their simulation because the flow through the open boundary was negligible. One other possible concern is that the simulation by \cite{PM07} was axisymmetric: the speed and extent of fast backflow appear to be smaller in some fully three-dimensional simulations compared with the equivalent axisymmetric cases \citep{Norman96,Aloy99}. We note, however, that the comparison may not be relevant to lobed FR\,I sources because the density contrast, $\eta = 0.01$, was much higher in these two examples, leading to cocoons which were far longer and thinner than those observed. The three-dimensional simulation of a relativistic jet with $\eta = 10^{-4}$ by \citet{Rossi08} indeed showed fast backflow with $\beta \approx 0.4$, despite the use of symmetric boundary conditions at the jet inlet. The initial conditions (jet Lorentz factor $\Gamma = 10$) and the assumption of a uniform external density are probably more appropriate to smaller physical scales than we consider here, however. Thus, although the assumptions and initial conditions of the simulations by \citet{PM07} and \cite{Rossi08} are not realistic enough to permit a quantitative comparison with our results, they do suggest that the idea of fast backflow is a reasonable one provided that the density contrast is very small ($\la 10^{-4}$)."

Suggestions: - In page 2, first column, line 29, the authors talk about "the largest velocity gradients". I would suggest to add something like ", i.e., the smallest $\beta_{edge} / \beta_{on-axis}$ ratios." to clarify the sentence.

Modified as suggested.

- In the caption of Figure 2, second/third line, I suggest to add "(jet)" after "On the right hand side" and in the fifth line add "(counter-jet)" after "On the left hand side".

We think that the current version is sufficiently explicit that the jet emission is on the right hand side, so we do not wish to lengthen the caption as this also risks making it more difficult for readers to understand.

- In Page 9, Section 4.1, it would be nice to have the references to the corresponding figures or sub-panels in each one of the items. It is true that they are referred in sections 4.2 and 4.3, but it would help.

We think that following the suggestion would result in an unreadable sub-section: there are too many such references, so we prefer to defer making them until Sections 4.2 and 4.3.

- In page 11, section 4.2, item (iii), the authors state that "the counter-jet appears wider than the jet at a given isophotal level". Maybe it should be specified that this occurs for faint levels, as they do in the fourth item of section 4.3.

Agreed and added.

- In the caption of figure 12, third line, add "(see section 4.1)", or similar, after ", as indicated in the captions".

Done (also same point in Fig 8).

- In page 21, second column, line 23 (end of the paragraph), it reads "..are quite unlike those observed." Change for "..are quite unlike those observed in those sources." or similar.

".. those observed in 0206+35 and 0755+37."

Additional changes

In paragraph 5 of the Introduction, we drop the reference to \beta as a "normalized" velocity, since we have already defined it and we refer to it consistently as the velocity later in the paper.

We have rewritten paragraph 6 of the Introduction, which discusses width asymmetries in the B2 sample and their compatibility with our detailed jet models. The rewrite removes a possible source of confusion: our model for 3C 296 actually predicts a rather small ratio of jet/counter-jet width from Gaussian fitting for small angles to the line of sight, but we originally implied it did not. The specific argument about the brightness distributions of 0206+35 and 0755+37 in the following paragraph is unaffected.

We have added a reference for the rotation measure of 0755+37 which was accidentally omitted from the original version (Guidetti et al. 2012).

Also in Section 2.2, we say "residual depolarization is predicted to be negligible at this frequency" rather than "we have checked that residual depolarization is negligible at this frequency", since our argument is based on measurements at 1.4 and 4.9 GHz and the known wavelength dependence of Faraday rotation.

In Section 3.3, we say "in terms of r and z" rather than "as functions of r and z".

We have corrected typographical errors affecting the backflow radius in Section 3.3.1 and Table 4 and made a few other changes to the typesetting of the table to remove potential ambiguities.

We have increased the suggested size of Fig 6 since it was even more difficult to read after adding the extra label.

Section 4.2, point (iv). We now say "between 2.5 and 6 arcsec from the nucleus" rather than "2.5 and 5 arcsec" (slightly more accurate).

We realised that there was no reference to the Appendix in the context of models of 0206+35 and 0755+37 (to which it is mainly relevant) and have added a new second paragraph to Section 6.1 to cover this point. The reference to the Appendix in the penultimate paragraph of this Section (where we discuss 3C 296) has been shortened to compensate.

We have amalgamated Sections 7.2 and 7.3 to avoid duplication. We have also added a final paragraph about proposed simulations.

In the Appendix, we have noted that we think that deeper observations could potentially allow us to remove residual lobe contamination and to test the toroidal-field outflow model more rigorously.