

Dear Editor,

According to comments of editor and referees, we have made the experimental evidences, also references have been added specifically Kevrekidis et al, describing the properties of mKdV waves. Also, the numerical properties of RK waves make possible experimental observations. Throughout, the manuscript the English has been improved by foreigner.

Specifically, we have made the following changes in our manuscript according to your comments:

- 1) In line 19, we remove the following words “in the ionospheric in the ionospheric E-layer”
- 2) In line 21, we add the following words “with cubic nonlinearity”.
- 3) In line 29-82, we rephrase the “Introduction”
- 4) In line 90-93, we changed the “In such E-layer therefore, two-dimensional consideration of the” with “In weakly ionized ionospheric E-layer plasma, we consider ...” and “here” with “and”.
- 5) In line 92, the word “with” is replaced with “where”
- 6) In line 98, we changed “... is the z-component of vorticity ...” with “... describes the evolution of the ...”
- 7) In line 102, we changed “... inhomogeneity present in the vertical component of angular velocity” with “latitudinal inhomogeneity of angular velocity”;
- 8) In line 105, the following reference “Kaladze, et al. 2013” is replaced with “Kaladze, et al. 2013a, 2013b”
- 9) In lines 111-116, the repeated lines are removed.
- 10) In line 118, the word “in” is replaced by “for”.
- 11) In line 122, we changed “[1, 2]” by “(Pedlosky (1987); Satoh (2004)).”
- 12) In line 126, we changed “considered as” with “considered in the following manner:”
- 13) In line 131, we removed the following words “along with a normalized small parameter $\varepsilon \ll 1$.”
- 14) In line 132, we changed the following words “Which forms” with “This assumption makes it”.
- 15) In line 137, we add the following line “where $\varepsilon \ll 1$ is a small parameter indicating that the perturbed quantities are small compared to the background parameters.” after Eq. (4).
- 16) In line 150, we changed the word “throughout” with “In” and following wording “, and the following linear differential operators are introduced” have been added at the end of sentence.
- 17) In line 157, the word “involves” is replaced by “takes into account”.
- 18) In line 158, the word “inhomogeneous” is replaced by “inhomogeneity of the”
- 19) In line 158-159, the following reference “Kaladze et al. [16].” is modified by Kaladze et al. (2009).”
- 20) In line 161, we rewrite “Furthermore, we denote the disturbed stream function ψ (the asymptotic expansion) as: ” as “Furthermore, we expand the stream function ψ (in series with respect to the ε) as:”

- 21) In line 165-166, we rewrite “....., from the lowest order $O(\varepsilon)$, we get the following equation with conditions of boundary:” as “By using Eq. (8) into Eq. (6), we obtain from the lowest order $O(\varepsilon_0)$, the following equations,”
- 22) In line 191-192, the following line “Here it is pointed out that the dispersion effect competes with weakly nonlinear effect.” Is replaced by “....., given in the definition of, which appears through the Jacobian in Eq. (9).”
- 23) In line 198, after “we” the following words have been added “again perform a separation of variables,”
- 24) In line 204-205, we change the following sentence “...results in the ...” with “we get the modified KdV (mKdV) equation”
- 25) In line 205, the following reference “[17].” is replaced by “(Kaladze et. al (2009))”
- 26) In line 208, after Eq. (15), the following sentence “This equation has a cubic nonlinearity, whereas the standard KdV equation has a quadratic nonlinearity.”
- 27) In line 212, the word “where” has been added.
- 28) In line 215-216, the following lines “... equation (15) and ...” have been changed by “with cubic nonlinearity for Rossby waves ...”
- 29) In line 217, we have been changed “... point out here that the functions ...” with “...point out here the meridional dependence of functions...”
- 30) In line 217, we replaced the following word “are related” with “that appears in the”
- 31) In line 220, the reference “Wazwaz A-M., 2009” is replaced with “Wazwaz (2009))”.
- 32) In line 221, the words “interesting in soliton” is replaced with “interested in a”
- 33) In line 221, the following line “The single soliton solution of equation (15) is given as ...” is added.
- 34) In lines 228, after “(16)-(17).” The followings lines “In order for a wave to have an exact solitary solution associated to it, one needs to a robust equation like the KdV. Modified KdV, as well, has infinite conservation laws associated to them, and hence is integrable ...”
- 35) In line 233, the word “given” is replaced with “present”
- 36) In line 233, the word “have” has been added.
- 37) In line 236, the word “latitudinal” have been added.
- 38) In line 239, the word “-” have been added twice.
- 39) In line 241, the word “modified KdV” is changed with “mKdV”
- 40) In line 246, the word “spatial inhomogeneous” is changed “the spatially inhomogeneous”
- 41) In line 248, the word “Looking forward” is changed with “In anticipation of future”
- 42) In line 249, we change the word “give” with “expect the”
- 43) In line 252, the word “the” has been added.
- 44) In line 252, the word “they” is replaced with “RK waves”
- 45) In line 254, we changed the words “charged particles’ density” with “the number density of the charged particles”
- 46) In line 255, the following sentence “(which is so suitable for experimental observations)” has been added after “during the daytime and nighttime conditions”
- 47) In line 256, we changed the words “the wavelength” with “have wavelengths”
- 48) In line 265, we changed the words “Discussed” with “RK”
- 49) In line 268-269, we changed the words “will collect” with “provide”
- 50) In references [4-10, 12-13, 15-18, 22, 24-26, 28], the word “&” is throughout replaced with “and”.
- 51) In line 294, we remove the reference 3.
- 52) In line 307, we remove the reference 8.
- 53) In line 314, we remove the reference 11.

- 54) In line 314, after reference 10 we add new reference “Futatani S., Horton W., and Kaladze T.D., Nonlinear propagation ...”
- 55) In line 333, we shifted the reference [22] here, also two new references “Kahlon L.Z., and Kaladze T.D., Generation of zonal flow ...” , also “Kaladze T., Tsamalashvili L., Kaladze D., Ozcan O., Yesil A., and Inc M., Modified ...” has been added after it.
- 56) In line 335, we remove the reference [20] and add the following reference “Vukcevic M. and Popovic L. Č., Solitons in the ionosphere-Advantages and ...”
- 57) In line 344, we add the following reference “Kevrekidis P.G., and Khare A., Saxena A., Herring G., On some classes of mKdV ...”

Yours Sincerely,

Authors