

## Response to the Reviewers comments-1

**Comment1:** I would start my abstract with an introductory sentence to explain what magnetotellurics is. For instance: "Magnetotelluric methods (MT) are passive geophysical techniques based on time variations of the geoelectric and geomagnetic fields in order to measure the electrical resistivity of subsurface layers."It will likely improve the readability of authors' manuscript and will make it more appealing.

**Ans 1:** The suggestion has been incorporated in the abstract of revised manuscript on page no. 1 and line 13-16. The abstract has been started with 'Magnetotelluric methods (MT) are passive geophysical techniques based on time variations of the geoelectric and geomagnetic field in order to measure the electrical resistivity of surface layer. It is most effective geophysical techniques to study the deep structure of the Earth's crust, particularly in steep terrain like the Garhwal Himalaya region'.

**Comment 2:** In the paper I cannot find a section devoted to data and a list of publications or repository where I can find data is lacking, even though previous publications are cited throughout the manuscript. Data sources MUST be added explicitly at least at the end of the paper with a section called "DATA AVAILABILITY"

**Ans 2 :** The data source has been added to the manuscript in model figure 1 on page no. 7 and line 140.

**Comment 3:** I suggest: the shallow layers of the Earth

**Ans 3:** The suggestion has been incorporated 'in the interior of earth' has been replaced by 'the shallow layers of the Earth 'on page no 2 and line 32 in the revised manuscript.

**Comment 4:** To add the word 'Geometries'

**Ans 4:** Geometries has been added on page no 2 and line 46

**Comment 5:** To add the symbol :

**Ans 5 :** The symbol ':' has been added on page no. 3 and line 67

**Comment 6:** with

**Ans 6:** 'to' has been replaced by 'with' on page 4 and line 71

**Comment 7:** by the

**Ans:** 'with has been replaced by 'by the' on page 5 and line 91

**Comment 8:** Are distortion coefficients complex number? If yes authors can use this adjective, otherwise, please, remove it, otherwise it can produce misunderstandings

**Ans 8:** The complex coefficients  $D(f, x)$  are distortion coefficients has been added on page no. 5 and line 94 in the revised manuscript

**Comment 9:** Write the tensorial product in an appropriate and please.

**Ans 9:** Also write equation no. 7 and equation 8 on page no. 6 and line 116 and 118

**Comment 10:** 10000  $\Omega$ .m change in 10 k $\Omega$ .m and '  $\Omega$ .m'

**Ans 10:** now 10000  $\Omega$ .m has been replaced in 10 k $\Omega$ .m on page no. 6 and line 130 and '  $\Omega$ -m' repaced by '  $\Omega$ .m' in all revised manuscript.

**Comment 11:** The picture is not to scale both in the vertical and horizontal axis. I ask the authors to improve it.

**Ans 11:** Fig. 1: Topographic model of 500  $\Omega$ -m half-space with a resistive body of 10 k $\Omega$ .m embedded from the surface relief (Chouteau and Bouchard, 1988) has been added the scale on page no 7 and line 140 in revised manuscript.

**Comment 12:** I suggest to set more appropriate vertical scales in order to allow better readability of the figures. E.g., for the relative error (Res.) plot 0-1.0 instead of [-0.5, 2]

**Ans 12:** The vertical scale of fig 4 for the relative error (res) plot 0-1.0 has been fixed to have better readability on page no. 10 and line 158 in the revised manuscript.

**Comment 13:** Add a white space on line 163 page no 10.

**Ans 13:** The space has been added on page no. 10 and line 168 of the revised manuscript.

**Comment 14:** Please add: Figure not to scale for better readability.

**Ans 14:** Scale has been added to have better readability in figure 5 in line no 180 on page no. 11 in the revised manuscript.

**Comment 15:** Are all these digits significant? Please, report just the significant ones. Thanks

**Ans 15:** All digits has been corrected up to significant figures on line numbers 178, 179, 189, 190,194, 197, 216, 217, 235, 236, 237 on page no. 11, 12, 14, 17, in the revised manuscript.

**Comment 16:** I suggest to change the settings for the vertical axis to improve the quality of this figure: there are several subplots, so, please, save space plotting data well distributed in each plot.

**Ans 16:** In order to save space vertical axis scale has been improved in fig 6 and fig 7 on page 13, 14 and line 200, 205 in the revised manuscript.

**Comment 17:** S. Saini I suppose.

**Ans 17:** Thank you sir, yes, you are correct, S. Saini has been added on page no 19 and line 259 of the revised manuscript.

## **Response to the Reviewers comments-2**

**Comment 1:** Do not use the phrases such as “in this paper”, in this research paper” in the abstract.

**Ans 1:** ‘In this paper’ has been replaced by ‘In this study’ on page no 1 and line 18 in revised manuscript.

**Comment 2:** This sentence is too long and a bit ambiguous, please reform it.

**Ans 2:** The relative errors between two terrain correction procedures were calculated with respect to flat earth and were very less or almost zero for most of the sites

along the Roorkee to Gangotri profile except at the foothill where the error was high at lower periods has been added on page no 1 and line 22-25 in revised manuscript.

**Comment 3:** Modify “interior” to “interior structures”

**Ans 3:** ‘interior’ has been modified by ‘the shallow layers of the Earth’ added on page no 2 and line 32 in revised manuscript.

**Comment 4:** What do the “different types of terrain geometrics” mean? Please clarify them.

**Ans 4:** The 2D numerical techniques have been used for different type terrain geometries to remove topography effects from the data. The analogue, analytic, and numerical solution methods were used to study the analogue model (Wescott and Hessler, 1962; Faradzhev et al., 1972). Various two-dimensional (2D) numerical techniques have been used for the numerical treatment of the topographic effects like networking analogy (Ku et al., 1973; NgCo, 1980) and Rayleigh scattering numerical modeling techniques (Reddig and Jiracek, 1984; Jiracek et al., 1989), finite element method (Wannamaker Stodt and Rijo, 1986; Frankle et al., 2007) and finite difference method (Josef Pek and Tomas Verner, 1996; Yutaka Sasaki, 2003 and Tyagi et al., 2007) has been added on page no. 3 and lines 45-52 in revised manuscript.

**Comment 5:** Please give at least three references to support the statement of “many researchers”.

**Ans 5:** References have been added on page no.3 and line 54 in revised manuscript.

**Comment 6:** Finite difference method has also been used to treat the topographic effects, please search some papers. The Finite difference method has been mentioned as the main technique in the following paragraph, however, it is never been mentioned.

**Ans 6:** finite difference method (Josef Pek and Tomas Verner, 1996; Yutaka Sasaki, 2003 and Tyagi et al., 2007) has been added on page no. 3 and lines 50-51 in revised manuscript.

**Comment 7:** This sentence is confusing, please correct it.

**Ans 7:** Two correction procedures, first adopted by Chouteau and Bouchard (1988) and second by Nam et al. (2008), were used to correct the MT data has been added on page no.4 and line 77 and 78 in revised manuscript.

**Comment 8:** Were should be where.

**Ans 8:** 'where' has been added on page no. 4 and line 86 in revised manuscript.

**Comment 9:** H-polarization may be replaced with TM mode, which was used in previous section.

**Ans 9:** 'TM mode' has been added on page no 4 line 88 in revised manuscript.

**Comment 10:** "Where" should be use the lower-case format.

**Ans 10:** 'where' has been added on page no.4, 5 and line 86, 93, 100 and 109 in revised manuscript.

**Comment 11:** equation (7) needs to be corrected.

**Ans 11:** 'equation (7)' has been added on page no. 6 and line 116 in revised manuscript.

**Comment 12:** Figure2, the symbol is too large to be seen clear. And a plot of relative error is better to be provide to show the similarity or the deviation.

**Ans 12:** 'Figure 2' has been added on page no. 8 and line 143 in revised manuscript.

**Comment 13:** Fig.3 should be replaced with Figure 3.

**Ans 13:** 'Fig. 3' has been replaced by 'Figure 3.' on page no. 9 and line 146 and 'Fig. ' replaced by 'Figure' in all revised manuscript.

**Comment 14:** The symbol is too large to be seen clear in Fig.3.

**Ans 14:** figure 3 has been added on page 9 and line 154 in revised manuscript.

**Comment 15:** This section is only the construction of the model rather the modeling. The content of the modeling should contain the model, gridding, method and results.

**Ans 15:** The content of the modeling should contain the model, gridding, method, revised manuscript page no. 11 and lines 162–182, and result detail in the result and discussion.

**Comment 16 :** what does the "afficacy" mean?

**Ans 16:** afficacy" has been replaced by accuracy on page no. 18 and line 251 in revised manuscript.

## Response to the Editor comments

**Comment 1-**Equations (5) and (6): the dot product symbol (.) has to be shifted a bit up.

**Ans1-** The symbol ‘.’ has been replaced with ‘·’ in the equations (5) and (6) on page no. 5, 6 and line 108, 113

**Comment 2-** Fig. 1: a) Within the Fig. 1: change “ $10^7 \Omega \text{ m}$ ” in “ $10^7 \Omega \cdot \text{m}$ ”, change “ $10000 \Omega\text{-m}$ ” in “ $10\text{k}\Omega \cdot \text{m}$ ”, change “ $500\Omega\text{-m}$ ” in “ $500\Omega \cdot \text{m}$ ”;  
b) explain in the caption or in the text the meaning of letters A to I; c) in caption of Fig. 1: the dot product symbol (.) has to be shifted a bit up: change “ $500\Omega\text{-m}$ ” in “ $500\Omega \cdot \text{m}$ ”, change “ $10\text{k}\Omega\text{-m}$ ” in “ $10\text{k}\Omega \cdot \text{m}$ ”

**Ans 2-** All changing has been in the revised manuscript page no. 7

**Comment 3-** Fig. 2, Fig. 3, Fig. 6, Fig. 8, Fig. 10: with reference to resistivity, in the y-axis label change “ $\Omega\text{-m}$ ” with “ $\Omega \cdot \text{m}$ ”; with reference to phase, in the y-axis label change “ $^\circ$ ” with “deg”

**Ans 3-** All these units have been uniformed in fig 2, fig 3, fig 6, fig 8 and fig 10 of revised manuscript.

**Comment4-** The “ $\Omega\text{-m}$ ” appear many (too many!) times in the text and within the figures:  
Change it in “ $\Omega \cdot \text{m}$ ”

**Ans 3-** “ $\Omega\text{-m}$ ” has been substituted by “ $\Omega \cdot \text{m}$ ” at all places in the revised manuscript.

**Comment 5-**Reference: “Chouteau, M., and Bouchard, K.: Two-dimensional terrain correction in magnetotelluric. Surveys Geophysics. 53 854-862, 1988”., has to be corrected in “Chouteau, M., and Bouchard, K.: Two-dimensional terrain correction in magnetotelluric surveys. Geophysics. 53 854-862, 1988.”

**Ans 5-** The suggestion has been incorporated in reference no 3” Chouteau, M., and Bouchard, K.: Two-dimensional terrain correction in magnetotelluric Surveys. Geophysics. **53** 854-862, 1988.” In revised manuscript