We thank the reviewers for their constructive and helpful suggestions. We have provided our responses to the reviewers’ comments and believe that our manuscript is much improved as a result.

The main paper improvements are:

1. Reference for the implementation of the parametrization of Kzz in the SOCRATES model is added **(P.5, L.12-17)**: “In the SOCRATES model two options are available for the parameterization of the gravity wave forcing and vertical diffusion coefficient (Huang et al., 1998). The default standard option uses the Lindzen-Holton gravity wave breaking scheme (Lindzen, 1981; Holton, 1982). A second option is to use the parameterization scheme developed primarily by Fritts and Lu (1993), which uses a general gravity wave spectral formulation provided by the observed gravity wave spectrum to deduce how the gravity wave energy flux responds to variation in the background environment. The first scheme was adopted in the current NIES TM simulation.”
2. Minor corrections by Anonymous Referee #1 are revised.
3. The description of the model vertical grid was updated **(P.3, L.25-P4.L3)**: “The model uses revised version of hybrid-isentropic grid. Original version used isentropic levels above 350 K potential temperature level and sigma levels between surface and 350 K level (Belikov et al., 2013b). A modified hybrid isentropic grid was introduced to simulate better vertical transport above tropopause, extending bottom level of isentropic part to 295 K, as first used in NIES TM simulation for age of air intercomparison study (Krol et al., 2018). To limit application of the isentropic grid to mid to upper troposphere, for each potential temperature level between 295 K and 350 K, a corresponding upper limit for pressure is set at fixed sigma level. For each theta level in a list [295, 300, 305, 310, 315, 320, 330, 340], upper sigma limit is gradually changing from sigma level of 0.6 for 295 K level to 0.35 for 340 K level, as [0.6, 0.54, 0.5, 0.47, 0.44, 0.41, 0.38, 0.35, 0.32]. For model levels between 295 and 340 K, once the sigma level reaches the prescribed maximum for this model level, vertical transport switches from one based on diabatic heating rate to using vertical wind provided by reanalysis. Over the isentropic part of the grid, the vertical transport follows the seasonally varying climatological diabatic heating rate derived from reanalysis.”

The reviewers’ specific comments (shown in blue) are addressed below.

**Anonymous Referee #1**

The authors addressed the reviewer comments adequately so I recommend publication with consideration of the following minor changes.

Pg. 6, line 12: add ‘is’ before ‘required’

Pg. 7, line 3: add ‘the’ before ‘three terms’

Pg. 7, line 9: change to ‘inversely proportional’

Pg. 7, line 10: change ‘takes’ to ‘has’, change to ‘cold regions’

Pg. 7, line 12: remove ‘For all that,’

Pg. 14, line 6: change to ‘values’

Pg. 14, line 13: ‘…decreases rapidly for age values older than 4 years,’

Pg. 14, line 15: change ‘The’ to ‘This’ and remove comma after ‘significantly’

The above corrections are revised.

Pg. 14, lines 16-18: It appears from Figure 9 that the model-observation discrepancy is significant for nearly all ages, not just for ages older than 4 years. Is there some measure of significance used here to evaluate the differences?

Agree. The sentence was revised **(P.14, L.8-11)**: “Figure 9 shows a near one-to-one relationship between AoA and GS regardless of latitude and height. Although the model–observation discrepancy is significant for all layers, the distributions of observations show a similar pattern for the lower part of the stratosphere despite large scatter. The positive <δ> values obtained from observations are not reproducible according to the theory.”