We present zonal and vertical electric fields estimated at E-region heights in the Brazilian sector. The technique for obtaining the vertical electric field is based on its proportionality to the Doppler velocities of type 2 irregularities as detected by coherent radars. Zonal electric fields are obtained from the vertical electric fields based on their relation through the Hall-to-Pedersen ionospheric conductivities ratio. The 50 MHz backscatter coherent (RESCO) radar was used to estimate the Doppler velocities of the irregularities type 2 embedded in the equatorial electrojet. A magnetic field-aligned-integrated conductivity model was developed for proving the conductivities. It considers a multi-species ionosphere and a multi-species neutral atmosphere, and uses the IRI 2007, the MISIS 2000 and the IGRF 10 models as input parameters for ionosphere, neutral atmosphere and Earth's magnetic field, respectively. The ion-neutron collision frequencies of all the species are combined through the momentum transfer collision frequency equation, and different percentages of electron-neutron collisions were artificially included for studying the implication of such increase in the zonal electric field, which resulted ranging from 0.13 to 0.49 mV/m between the 8 and 18 h (LT), under quiet magnetic conditions. Finally, we present the amount of temperature increase need to raise the electron-neutron collision frequencies to the make the drive the zonal electric field vertical gradient close to zero.