To interpret polar ice core records of sulfate and methanesulfonic acid (MSA), a good understanding of the processes involved in dimethylsulfide (DMS) oxidation is needed. In particular, the signification of changes in the MSA to non-sea-salt sulfate ratio remains unclear. In cold environment, DMS oxidation through the addition channel, partly leading to MSA, prevails over the abstraction channel that does not yield MSA. However, at several Antarctic stations, the MSA to non-sea-salt sulfate ratio is found higher in the summer (warmer) season than in winter. To improve the interpretation of the MSA to non-sea-salt sulfate ratio, we wish to locate the sources contributing to the sulfur species in Antarctica and to identify how they change with season. To do this, we use the Laboratoire de Météorologie Dynamique (CNRS, Paris, France) Atmospheric General Circulation Model with an imbedded sulfur chemistry module (Cosme et al., Sulfur cycle in the high southern latitudes in the LMD-ZT General Circulation Model, JGR 107). The climate /chemistry model is first run forward to archive climate and chemistry parameters which affect the sulfur species. These parameters are then used to run backward an adjoint of the model, thus providing an inverse history of transport and chemistry. We will first present the adjoint transport and chemistry equations. Then we will show and discuss preliminary results related to the interpretation of the MSA to non-sea-salt sulfate ratio in the Antarctic region.