CALPUFF Input Variables

CALPUFF Model Input Group 1: General Run Control Parameters			
Parameter	Input Used	Default	Comments
LCFILES	F	-	User defined
NMETDAT	36	1	User defined
NPTDAT	0	0	
NARDAT	0	0	
NVOLDAT	0	0	
METRUN	0	0	
IBYR	2001	-	User defined, also modeled 2002 and 2003
IBMO	1	-	User defined
IBDY	1	-	User defined, 2002 and 2003 = 2
IBHR	1	-	User defined
XBTZ	5	-	User defined
IRLG	8760	-	User defined; 2001 & 2002 = 8760, 2003 = 8736
NSPEC	9	5	PM species are broken into several size categories acc. to *EPA's Compilation of Air Pollutant Emission Factors*
NSE	7	3	Number of chemical species to be emitted
ITEST	2	2	
MRESTART	2	0	Set in case of computer/software restart
NRESPD	240	0	User defined
METFM	1	1	
MPRFFM	1	1	
AVET	60	60	
PGTIME	60	60	

CALPUFF Model Input Group 2: Technical Options			
Parameter	Input Used	Default	Comments
MGAUSS	1	1	
MCTADJ	3	3	
MCTSG	0	0	
MSLUG	0	0	
MTRANS	1	1	
MTIP	1	1	
MBDW	2	1	N/A, no building downwash modeled
MSHEAR	0	0	
MSPLIT	0	0	
MCHEM	1	1	
MAQCHEM	0	0	
MWET	1	1	
MDRY	1	1	
MTILT	0	0	
MDISP	3	3	
MTURBVW	3	3	
MDISP2	3	3	
MTAULY	0	0	
MTAUADV	0	0	
MCTURB	1	1	
MROUGH	0	0	
MPARTL	0	1	See Appendix A for discussion.
MTINV	0	0	
MPDF	0	0	
MSGTIBL	0	0	
MBCON	0	0	
MSOURCE	0	0	
MFOG	0	0	
MREG	0	1	No checks made

CALPUFF Model Input Group 3: Species List-Chemistry Options.					
CSPEC	Modeled	Emitted	Dry Deposition	Output Group Number	Comments
SO2	1	1	1 (GAS)	0	User Defined in accordance with VISTAS guidance for EGUs
SO4	1	1	2 (Particle)	0	
NOX	1	1	1 (GAS)	0	
HNO3	1	0	1 (GAS)	0	
NO3	1	0	2 (Particle)	0	
SOA	1	1	2 (Particle)	0	
PMF	1	1	2 (Particle)	0	
PMC	1	1	2 (Particle)	0	
EC	1	1	2 (Particle)	0	

CALPUFF Model Input Group 4: Map Projection and Grid Control Parameters.			
Parameter	Input Used	Default	Comments
PMAP	LCC	UTM	Map Projection Used
FEAST	0	0	
FNORTH	0	0	
IUTMZN	0	-	User Defined
UTMHEM	N	-	User Defined
RLAT0	40N	-	User Defined
RLON0	97W	-	User Defined
XLAT1	33N	-	User Defined
XLAT2	45N	-	User Defined
DATUM	NWS-84	-	User Defined
NX	248	-	User Defined
NY	257	-	User Defined
NZ	10	-	User Defined
DGRIDKM	4	-	User Defined
ZFACE	0, 20, 40, 80, 160, 320, 640, 1200, 2000, 3000, 4000	-	As specified in *Example Screening BART Simulation using the VISTAS Regional Domain by Earth Tech Inc*.
XORIGKM	718.005	-	User Defined
YORIGKM	-1214.003	-	User Defined
IBCOMP	25	-	User Defined
JBCOMP	144	-	User Defined
IECOMP	153	-	User Defined
JECOMP	223	-	User Defined
LSAMP	F	T	Sampling grid is not used
IBSAMP	1	-	Sampling grid is not used
JBSAMP	1	-	Sampling grid is not used
IESAMP	1	-	Sampling grid is not used
JESAMP	1	-	Sampling grid is not used
MESHDN	1	1	

CALPUFF Model Input Group 5: Output Options

Parameters	Input Used	Default	Comments
ICON	1	1	
IDRY	0	1	Output file containing dry fluxes is not created
IWET	0	1	Output file containing wet fluxes is not created
IT2D	1	1	
IRHO	1	0	Output file containing 2D density is created
IVIS	1	1	
LCOMPRS	T	T	
IQAPLOT	1	1	
IMFLX	0	0	
IMBAL	0	0	
ICPRT	0	0	
IDPRT	0	0	
IWPRT	0	0	
ICFRQ	1	1	
IDFRQ	1	1	
IWFRQ	1	1	
IPRTU	3	1	Used ug/m3 and ug/m2/s
IMESG	2	2	
LDEBUG	F	F	Debug output
IPFDEB	1	1	Debug output options
NPFDEB	10	1	Debug output options
NN1	10	1	Debug output options
NN2	10	10	Debug output options

CALPUFF Input Group 6: Sub-Grid Scale Complex Terrain Inputs.

Parameters	Input Used	Default	Comments
NHILL	0	-	Not set in IWAQM Phase 2 Report
NCTREC	0	-	Not set in IWAQM Phase 2 Report
MHILL	2	-	Not set in IWAQM Phase 2 Report
XHILL2M	0	-	Not set in IWAQM Phase 2 Report
ZHILL2M	0	-	Not set in IWAQM Phase 2 Report
XCTDMKM	0.00E+00	-	Not set in IWAQM Phase 2 Report
YCTDMKM	0.00E+00	-	Not set in IWAQM Phase 2 Report

CALPUFF Model Input Group 7: Dry Deposition Parameters for Gases.

Species	Input Used	Default	Comments
SO2	0.1509	0.1509	
	1000	1000	
	8	8	
	0	0	
	0.04	0.04	
NOX	0.1656	0.1656	
	1	1	
	8	8	
	5	5	
	3.5	3.5	
HNO3	0.1628	0.1628	
	1	1	
	18	18	
	0	0	
	8E-08	8E-08	

CALPUFF Model Input Group 8: Dry Deposition Parameters for Particles.

Species	Input Used		Default		Comments
	Size	Std Dev			
SO4	0.48	2			All PM species except PMC were put into the smallest size bin. PMC was assigned the mass-weighted mean diameter for the 2.5 to 10 micron size range.
NO3	0.48	2			
PMC	5	2			
PMF	0.48	2			
SOA	0.48	2			
EC	0.48	2			

CALPUFF Model Input Group 9: Miscellaneous Dry Depostion Parameters.

Parameter	Input Used	Default	Comments
RCUTR	30	30	
RGR	10	10	
REACTR	8	8	
NINT	9	9	
IVEG	1	1	

CALPUFF Model Input Group 10: Wet Deposition Parameters.

Species	Input Used		Default		Comments
SO2	3.00E-05	0.00E+00	3.00E-05	0.00E+00	
SO4	1.00E-04	3.00E-05	1.00E-04	3.00E-05	
HNO3	6.00E-05	0.00E+00	6.00E-05	0.00E+00	
NO3	1.00E-04	3.00E-05	1.00E-04	3.00E-05	
PMF	1.00E-04	3.00E-05	1.00E-04	3.00E-05	
PMC	1.00E-04	3.00E-05	1.00E-04	3.00E-05	
SOA	1.00E-04	3.00E-05	1.00E-04	3.00E-05	
EC	1.00E-04	3.00E-05	1.00E-04	3.00E-05	

CALPUFF Model Input Group 11: Chemistry Parameters.

Parameters	Input Used	Default	Comments
MOZ	1	1	
BCKO3	12*80.0	12*80.0	
BCKNH3	12*0.5	12*10	Background ammonia concentration (ppb) as agreed upon by VISTAS states
RNITE1	0.2	0.2	
RNITE2	2	2	
RNITE3	2	2	
MH2O2	1	1	
BCKH2O2	12*1.0	1	
BCKPMF	12 *1	1	
OFRAC	0.15,0.15,0.2,0.2,0.2,0.2,0.2,0.2,0.	0.15,0.15,0.2,0.2,0.2,0.2,0.2,0.2,0.	
VCNX	12*50	50	

CALPUFF Model Input Group 12: Dispersion/ Computational Parameters			
Parameters	**Input Used**	**Default**	**Comments**
SYTDEP	5.50E+02	5.50E+02	
MHFTSZ	0	0	
JSUP	5	5	
CONK1	0.01	0.01	
CONK2	0.1	0.1	
TBD	0.5	0.5	
IURB1	10	10	
IURB2	19	19	
ILANDUIN	20	20	
ZOIN	0.25	0.25	
XLAIIN	3	3	
ELEVIN	0	0	
XLATIN	-999	-999	
XLONIN	-999	-999	
ANEMHT	10	10	
ISIGMAV	1	1	
IMIXCTDM	0	0	
XMXLEN	1	1	
XSAMLEN	1	1	
MXNEW	99	99	
MXSAM	99	99	
NCOUNT	2	2	
SYMIN	1	1	
SZMIN	1	1	
SVMIN	0.5, 0.5, 0.5, 0.5, 0.5, 0.5,0.37,	0.5	0.37 is the over water settings not present in the earlier version of CALPUFF
SWMIN	0.2, 0.12, 0.08, 0.06, 0.03, 0.016, 0.2, 0.12,	0.2,0.12, 0.08, 0.06, 0.03, 0.016	Additional values are for over water settings not present in the earlier versions of CALPUFF.
CDIV	0.0, 0.0	0.01	See Appendix A for discussion.
WSCALM	0.5	0.5	
XMAXZI	3000	3000	
XMINZI	50	50	
WSCAT	1.54, 3.09, 5.14, 8.23,	1.54, 3.09, 5.14, 8.23,	
PLX0	0.07, 0.07, 0.1, 0.15,	0.07, 0.07, 0.1, 0.15,	
PTG0	0.02, 0.035	0.02, 0.035	
PPC	0.5,0.5,0.5, 0.5,0.35,0.3	0.5,0.5,0.5, 0.5,0.35,0.3	
SL2PF	10	10	
NSPLIT	3	3	
IRESPLIT	1700	-	Not Used -- MSPLIT set to 0
ZISPLIT	100	100	
ROLDMAX	0.25	0.25	
NSPLITH	5	5	
SYSPLITH	1	1	
SHSPLITH	2	2	
CNSPLITH	1.00E-07	1.00E-07	
EPSSLUG	1.00E-04	1.00E-04	
EPSAREA	1.00E-06	1.00E-06	
DSRISE	1	1	
HTMINBC	500	500	
RSAMPBC	10	10	
MDEPBC	1	1	

CALPUFF Model Input Group 13: Point Source Parameters.			
Parameter	Input Used	Default	Comments
NPT1	2	-	User defined, set to number of stacks
IPTU	1	1	
NSPT1	10	0	used when seasonal and non seasonal emission rates are considered
NPT2	0	0	
SRCNAM	-	-	See Table 4-1 of the BART Modeling Report for source-
X	-	-	specific parameters and emision rates

CALPUFF Model Input Group 14: Area source Parameters.			
Parameter	Input Used	Default	Comments
NAR1	0	-	Not used
IARU	1	1	Not used
NSAR1	0	0	Not used
NAR2	0	-	Not used

CALPUFF Model Input Group 15: Line Source Parameters.			
Parameter	Input Used	Default	Comments
NLN2	0	-	Not used
NLINES	0	-	Not used
ILNU	1	1	Not used
NSLN1	0	0	Not used
MXNSEG	7	7	Not used
NLRISE	6	6	Not used
XL	0	-	Not used
HBL	0	-	Not used
WBL	0	-	Not used
WML	0	-	Not used
DXL	0	-	Not used
FPRIMEL	0	-	Not used

CALPUFF Model Input Group 16: Volume Source Parameters.			
Parameter	Input used	Default	Comments
NVL1	0	-	Not used
IVLU	1	1	Not used
NSVL1	0	0	Not used
NVL2	0		Not used

CALPUFF Model Input Group 17: Discrete Receptor Information			
Parameter	Input Used	Default	Comments
NREC	User Defined	-	User Defined

POSTUTIL Input Variables

POSTUTIL Processor Input Group 1: General Run Control Parameters			
Parameters	Input Used	Default	Comments
NFILES	1	1	
METFM	2	0	2-D files with either Rh, Temp or Rhoair in each
NMET	1	0	Multiple input met files for time period
LCFILES	F	T	Filenames not set to lower case
ISYR	2001	-	User defined
ISMO	1	-	User defined
ISDY	1	-	User defined
ISHR	1	-	User defined
NPER	8760	-	User defined
NSPECINP	9	-	User defined
NSPECOUT	9	-	User defined
NSPECCMP	0	-	User defined
MDUPLCT	0	0	
NSCALED	0	0	
MNITRATE	1	0	For ammonia limiting, computes the partition for the TOTAL concentration fields (SO4, NO3 and HNO3)
NH3TYP	3	-	Use monthly average background ammonia
BCKNH3	12*0.5	-999	Background NH3 set to 0.5 in accordance with VISTAS guidance

POSTUTIL Processor Input Group 2: Species Processing Information			
Parameter	Input Used	Default	Comments
ASPECI	SO2		All Species are processed
ASPECI	SO4		
ASPECI	NOX		
ASPECI	HNO3		
ASPECI	NO3		
ASPECI	SOA		
ASPECI	PMF		
ASPECI	PMC		
ASPECI	EC		
ASPECO	SO2		
ASPECO	SO4		
ASPECO	NOX		
ASPECO	HNO3		
ASPECO	NO3		
ASPECO	SOA		
ASPECO	PMF		
ASPECO	PMC		
ASPECO	EC		

CALPOST Input Variables

CALPOST Processor Input Group 1: General Run Control Parameters			
Parameters	Input Used	Default	Comments
ISYR	2001	-	
ISMO	1	-	
ISDY	1	-	
ISHR	1	-	
NHRS	8760	-	Number of periods to process
NREP	1	1	
ASPEC	VISIB	-	Process species for visibility
ILAYER	1	1	
A	0	0	
B	0	0	
LBACK	F	F	
MSOURCE	0	0	
LG	F	F	
LD	T	F	Discrete receptors provided on the website *http://www2.nature.nps.gov/* used.
LCT	F	F	
LDRING	F	F	
NDRECP	500*1	-1	
IBGRID	-1	-1	
JBGRID	-1	-1	
IEGRID	-1	-1	
JEGRID	-1	-1	
NGONOFF	0	0	

CALPOST Processor Input Group 2: Species Processing Information			
Parameter	Input Used	Default	Comments
MFRH	3	2	EPA (2003) f(RH) tabulation as specified *by VISTAS*
RHMAX	98	98	
LVSO4	T	T	
LVNO3	T	T	
LVOC	T	T	
LVPMC	T	T	
LVPMF	T	T	
LVEC	T	T	
LVBK	T	T	
SPECPMC	PMC	PMC	
SPECPMF	PMF	PMF	
EEPMC	0.6	0.6	
EEPMF	1	1	
EEPMCBK	0.6	0.6	
EESO4	3	3	
EENO3	3	3	
EEOC	4	4	
EESOIL	1	1	
EEEC	10	10	
LAVER	F	F	
MVISBK	6	2	As specified *by VISTAS*
BEXTBK	12	-	N/A, used method 6 for MVISBK
RHFRAC	10	-	
RHFAC	Depend on Class I area	12*value	Specified in Table A-3 from *Guidance for Estimating* *Natural Visibility Condition Under the Regional Haze Rule*
BKSO4	12*0.0	0.23	Values set in accordance with VISTAS guidance to establish Natural Background visibility
BKNO3	12*0.0	0.1	
BKPMC	12*0.0	3	
BKOC	12*0.0	1.4	
BKSOIL	12*11.40	0.5	
BKEC	12*0.0	0.02	
BEXTRAY	10	10	

CALPOST Processor Input Group 3: Output Options			
Parameter	Input Used	Default	Comments
LDOC	F	F	
IPRTU	3	1	Units used for concentartion and deposition - ug/m**3 , ug/m**2/s
L1HR	F	T	Not reporting 1-hr avarages
L3HR	F	T	Not reporting 3-hr avarages
L24HR	T	T	
LRUNL	F	T	Not reporting Run-Length averages
NAVG	0	0	
LT50	F	T	Top 50 table for each averaging time not selected
LTOPN	F	F	
NTOP	1	4	Number of Top values at each receptor selected
ITOP	1	1,2,3,4	Specific rank of Top values reported
LEXCD	F	F	
THRESH1	1.00E+01	-1	Identify the threshold for 1 hour averaging time by assigning a non-negative value
THRESH3	-1	-1	
THRESH24	-1	-1	
THRESHN	-1	-1	
NDAY	0	0	
NCOUNT	1	1	
LECHO	F	F	
LTIME	F	F	
LPEAK	F	F	
IECHO	366*0	366*0	
LPLT	F	F	
LGRD	F	F	
MDVIS	0	0	
LDEBUG	F	F	
LVEXTHR	F	F	

Appendix A

Discussion of CALPUFF modeling options used for BART analyses

Various CALPUFF model options were specified in an EPA memo issued by Dennis Atkinson and Tyler Fox of the Office of Air Quality Planning and Standards; the memo was entitled "Dispersion Coefficients for Regulatory Air Quality Modeling in CALPUFF", March 16, 2006. Of these various recommended settings, Southern Company, upon advice from ENSR, has used alternative settings for two specific options: CDIV and MPARTL. The values used by Southern Company and the reasons for these uses are provided below.

CDIV: This parameter affects the divergence criterion for dw/dz across puffs used to initiate adjustment for horizontal convergence. The value specified in the IWAQM Phase 2 report (1998) is 0.01 (1/sec). Since the time that report was generated, this option in CALPUFF was changed by the model developer, Earth Tech, to 0.0 to improve the model performance in the year 2000. The use of the smaller value gives better protection against mass accumulation within convergence zones by compensating with increased sigma-z to account for vertical movement of the air. The model change actually requires two values for CDIV (values at partial and full adjustment), and the default value for each was accordingly changed to 0.0. This was confirmed by Joe Scire in an email to Bob Paine dated 12/22/06 (a copy can be provided upon request). The old default value of 0.01 continues to be erroneously recommended by EPA, however, because the 1998 IWAQM guidance was never corrected, and EPA memos such as the Atkinson and Fox memo referenced above have not made the correction either. Some states, such as Minnesota (see http://www.pca.state.mn.us/air/regionalhaze.html) as well as Montana and other western states are using the current CDIV default values of 0.0, 0.0 in their BART analyses.

A number of CALPUFF input files provided on the TRC web site have 0.0, 0.0 as the selected CDIV values. Due to this reason and the updated default value specification for CDIV, Southern Company has elected to use the current default values of 0.0, 0.0.

MPARTL: This parameter affects the manner in which puffs interact with the mixing lid. A value of 0 means that the ISCST3 modeling approach is used; while a value of 1 means that the AERMOD approach is used. In the March 16, 2006 Atkinson and Fox memo, other AERMOD-related options (some default, some not) that had been accepted before this time were removed from the approved list. The MPARTL option was apparently retained (possibly an EPA oversight) as set to 1 in the memo, even though it is an AERMOD feature. A CALPUFF input file provided on the official TRC web site for VISTAS BART modeling (as well as the approved general EPA version) has MPARTL set to 0, which would be consistent with the rest of the changes affecting AERMOD options, and which is the CALPUFF default. Consistent with the other changes removing AERMOD-related settings, Southern Company has opted to set MPARTL to zero, the CALPUFF default.