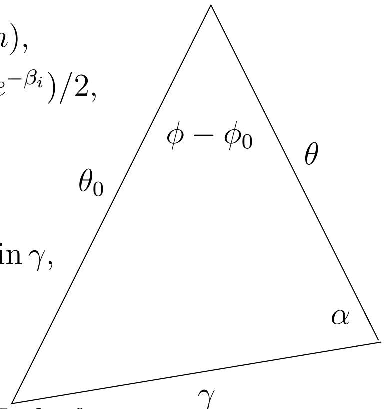
FORM TO SPECIFY INPUT DATA FOR TEMPERATURE PERTURBATION MODEL TDRAFT2

$T = T_0(t,r,\theta,\phi) + A_1 f(\psi_1 \sin\gamma) + A_2 f(\psi_2 \sin\gamma)$, where $T_0(t,r,\theta,\phi)$ is given by a background temperature model,
$\psi = \sum_{i=1}^{2} \psi_i$ is the stream function,
$\psi_i \sin\gamma = \left[\psi_{Ai}(h)\psi_{Bi}(\gamma)\sin\gamma - \frac{r_e w_i \sin^2\gamma_i}{2}\right]\psi_{Ci}(h)$,
$\psi_{Ai}(h) = \frac{h^2}{h_i^2+h^2}$, $\psi_{Bi}(\gamma)\sin\gamma = r_e w_i \sin^2\gamma_i (1-e^{-\beta_i})/2$,
$\psi_{Ci}(h) = (1-\tanh((h-z_i)/\delta_i))/2$,
$\beta_i = \frac{\sin^2\gamma}{\sin^2\gamma_i}$, $h = r - r_e$, r_e is the Earth radius.
$\cos\gamma = \sin\lambda_0\cos\theta + \cos\lambda_0\sin\theta\cos(\phi-\phi_0)$,
$\cos\alpha = [\sin\theta\cos\theta_0 - \sin\theta_0\cos\theta\cos(\phi-\phi_0)]/\sin\gamma$,
$\sin\alpha = \sin\theta_0\sin(\phi-\phi_0)/\sin\gamma$,
$\theta_0 = \pi/2 - \lambda_0$, and
$f(\psi) = A + r_e B\psi$.



This model represents the temperature perturbation as a function of the stream function that gives an updraft plus a down draft that is capped at the top and bottom.

Specify–
the model check for TDRAFT2 = ______4.0______ (w225)
the input data-format code = ____________ (w226)
an input data-set identification number = ____________ (w227)
an 80-character description of the model with parameters:

____

and the model values:
A_1 ____________ (w228)
A_2 ____________ (w229)
A ____________ Kelvin (w230)
B ____________ Kelvin s km^{-3} (w231)
λ_0 latitude of the updraft/downdraft ____________ rad, deg, km (w128)
ϕ_0 longitude of the updraft/downdraft ____________ rad, deg, km (w129)
w_1 maximum speed of the updraft ____________ km/s, m/s (w130)
γ_1 half width of the updraft ____________ rad, deg, km (w131)
h_1 depth of the inflow ____________ km, m (w132)
w_2 maximum speed of the downdraft ____________ km/s, m/s (w133)
γ_2 half width of the downdraft ____________ rad, deg, km (w134)
h_2 depth of the outflow ____________ km, m (w135)
z_1 height of the return outflow at the top ____________ km, m (w136)
δ_1 width of the return outflow at the top ____________ km, m (w137)
z_2 height of the return inflow at the top ____________ km, m (w138)
δ_2 width of the return inflow at the top ____________ km, m (w139)

OTHER MODELS REQUIRED: Wind/current perturbation model VDRAFT2 plus any background temperature model.

$$\frac{\partial T}{\partial r} = \frac{\partial T_0}{\partial r} + A_1 f\prime(\psi_1)\frac{\partial \psi_1}{\partial r} + A_2 f\prime(\psi_2)\frac{\partial \psi_2}{\partial r}$$
$$\frac{\partial T}{\partial \theta} = \frac{\partial T_0}{\partial \theta} + A_1 f\prime(\psi_1)\frac{\partial \psi_1}{\partial \theta} + A_2 f\prime(\psi_2)\frac{\partial \psi_2}{\partial \theta}$$
$$\frac{\partial T}{\partial \phi} = \frac{\partial T_0}{\partial \phi} + A_1 f\prime(\psi_1)\frac{\partial \psi_1}{\partial \phi} + A_2 f\prime(\psi_2)\frac{\partial \psi_2}{\partial \phi}$$
$$f\prime(\psi_i) = B$$
$$\frac{\partial \psi_i}{\partial r} = -rhv_{Hi}\sin\gamma$$
$$\frac{\partial \psi_i}{\partial \theta} = \left(\frac{1}{\sin\gamma}\frac{\partial \psi_i}{\partial \gamma}\right)\left(\sin\gamma\frac{\partial \gamma}{\partial \theta}\right)$$
$$\frac{\partial \psi_i}{\partial \phi} = \left(\frac{1}{\sin\gamma}\frac{\partial \psi_i}{\partial \gamma}\right)\left(\sin\gamma\frac{\partial \gamma}{\partial \phi}\right)$$
$$\frac{1}{\sin\gamma}\frac{\partial \psi_i}{\partial \gamma} = r^2 hv_{ri}$$

Definitions:

FORTRAN variable	Variable name	Definition
LAMBDA0	λ_0	Latitude of updraft/downdraft
PHI0	ϕ_0	Longitude of updraft/downdraft
W1	w_1	Maximum speed of updraft
W2	w_2	Maximum speed of downdraft
H1	h_1	Depth of inflow
H2	h_2	Depth of outflow
z1	z_1	Height of the return outflow at the top
z2	z_2	Height of the return inflow at the top
delta1	δ_1	Width of the return outflow at the top
delta2	δ_2	Width of the return inflow at the top
EARTHR	r_e	Radius of the Earth
EARSQ	r_e^2	
SING1SQ	$\sin^2\gamma_1$	
SING2SQ	$\sin^2\gamma_2$	
SINLAM0	$\sin\lambda_0$	
	θ_0	Co-latitude of updraft/downdraft
COSTH0	$\cos\theta_0$	
COSLAM0	$\cos\lambda_0$	
SINTH0	$\sin\theta_0$	
H1SQ	h_1^2	
H2SQ	h_2^2	
CONST1	$r_e w_1/2$	
CONST2	$r_e w_2/2$	
C1	$C_1 = \frac{r_e w_1 \sin^2\gamma_1}{2}$	
C2	$C_2 = \frac{r_e w_2 \sin^2\gamma_2}{2}$	
	r	Distance from center of Earth to ray point
RSQ	r^2	
H	h	Height of ray point above sea level
HSQ	h^2	
HCUBE	h^3	
	θ	Co-latitude of ray point
COSTH	$\cos\theta$	
SINTH	$\sin\theta$	

PH	ϕ	Longitude of ray point
COSPH	$\cos(\phi - \phi_0)$	
SINPH	$\sin(\phi - \phi_0)$	
	γ	Great circle angle between updraft/downdraft and ray point
COSGAM	$\cos\gamma$	
SINGAM	$\sin\gamma$	
SINGSQ	$\sin^2\gamma$	
psi	$\psi = \psi_1 + \psi_2$	Stream function
psisg	$\psi\sin\gamma = \psi_1\sin\gamma + \psi_2\sin\gamma$	
psi1	$\psi_1 = \psi_{A1}\psi_{B1}\psi_{C1}$	
psi1sg	$\psi_1\sin\gamma = \psi_{A1}\psi_{B1}\sin\gamma\psi_{C1}$	
psi2	$\psi_2 = \psi_{A2}\psi_{B2}\psi_{C2}$	
psi2sg	$\psi_2\sin\gamma = \psi_{A2}\psi_{B2}\sin\gamma\psi_{C2}$	
psiA1	ψ_{A1}	
psiB1	ψ_{B1}	
psiB1sg	$\psi_{B1}\sin\gamma$	
psiC1	ψ_{C1}	
psiA2	ψ_{A2}	
psiB2	ψ_{B2}	
psiB2sg	$\psi_{B2}\sin\gamma$	
psiC2	ψ_{C2}	
SGPGTH	$-\partial\cos\gamma/\partial\theta = \sin\gamma\partial\gamma/\partial\theta$	
SGPGPH	$-\partial\cos\gamma/\partial\phi = \sin\gamma\partial\gamma/\partial\phi$	
deltaT	ΔT	Temperature perturbation