evolve.txt Notes on evolution of KRC code, after the first 17 years. Newest on
top. Does not include all minor changes.
....
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2018Jul03 V3.5.6 Fixes related to occurance of condensation as frost
or snow in
TLATS and TDAY. Revised EPRED8. Described in 356notes.tex

2018Feb01 V 3.5.5 Change meaning of real parameter 38 from DDT, now
firm-coded
at 0.002, to the Photometric function code. which had been overloaded
with
parameter 21. This allows Photometric functions at the same time as
atmosphere. Fix code for solar eclipses; two new optional eclipse
input
lines.

2017Oct05 V 3.5.4 Error log file name to the millisec, with delay to
ensure
unique in case of massive cluster runs. Correct blunder in evmono3d.f
that had
the offset temperature 20K too low; applied to versions 3.5.1 and .2
only

2017apr06 V 3.5.2 Add to 3.5.1 the ability to output binary files of
surface
temperatures for all N2 time-steps on the last day of the last season
for one
latitude, any subset of cases.

2017apr04 V 3.5.1 [Not released] Incorporates eclipses and planetary
fluxes. New
routines TFINE and ECLIPSE. Also, ensure some atm-only output
variables are not
left over from prior case. Use EVMONO3D, a modification of EVMON038
that has the
scaling coefficients firm-coded and is 9\% faster; applies only to T-
dependent
materials.

2017mar24 V 3.4.5 With fix of bug in Minnaert and Lommel-Seeliger
photometric
functions. Released as a replacement for TLATS only.

2017mar08 Presentation at ASU THEMIS team meeting on version 3.4.4,
which is
identical to 3.4.3 except for documentation

2017feb23 V 3.4.3 Released. Correct effective azimuth of tilted surfaces
by reversing diurnal Sun motion (TLATS).

2016sep05 V 3.4.2 Released as alpha. Correct the version 3 layer-doubling factor
from 4 to 2. The convergence safety factor in code SCONVG and the input minimum
CONVF are both the square of that described in the JGR article in section 3.2.3
. Replace use of R2R family of routines, which overloaded arguments so that the
compiler could not check out-of-bounds, with FILLMV set of routines with a FILL
and MoVe routine for each word type.

2016may20 V 3.4.1 Option to use flat-model result for the far-field of sloped
models. Allow up to 3 binary files open at once. Major changes to TDISK and new
routines TFAR (read a type -1, -2 (had been -1) , or -3 file) and CUBUTERP
(cubic spline over uniformly spaced data). Modest changes to KRC, TSEAS, TLATS,
TDAY. Minor changes to TCARD and to commons HATCOM, FILCOM, and UNITS. See the
V34 USers Guide for documentation.

2016mar22 Version 3.3.1 Minor glitch fixes. LD18 is used to indicate when
parameter and layer table were last printed; used to force their print if a
numerical blowup happens.

2016mar07 Version 3.3.0 Released as alpha, later withdrawn. IB becomes IIB, flags
made negative, and positive values represent geothermal heat flow in
milliwatts/m^2. Allow bond albedo function beyond Lambert. Option for zone
table, major re-code of TDAY; new routine READZONE. Revision of time-doubling
code. Printing the layer table moved from TPRINT to TDAY. Changes to KRCCOM and
FILCOM. Start naming of source files with 2 digits of version number,
e.g. tday33.f; include files are all ...vvc.f where vv is first 2 parts of
version number. Soft links are used for routines and commons that had nill of
minor revisions.

2015dec24++ Version 3.2.3 TDAY: First time-double layer not less than 4. FLAY
now is the first physical layer. Real parameter 11 (ABRPHA) and 32 (FD32) become
the Clausius-Clapeyron coefficients used in function CO2PT; labeled SatPrA and
SatPrB in the input file. Values for CO2 (the prior hard-code) are 27.9546 and
3182.48, included in master323.inp; which is also updated to finer layers. Minor
print changes.

2015jun1 Version 3.2.1 Released to ASU. Add TUN8 subroutine to write a fort.77
file when I15 is 100+. TUN8 has access to several of the commons: see the code
to learn what the current version outputs; TUN8 would need to be modified by
user for their special need. KRC calls TUN8 at the start of each case to write a
header. If I15=101, then TDAY calls TUN8 on the last day of each season being
output to disk at each output hour. If I15=102, then TLATS calls TUN8 for every
latitude for every season being output to disk. Change KRCCOM to move ALAT and
ELEV earlier.

2014apr28 Version 2.4.1 Released to ASU. Fix blunder in the v2.x.x system when
using the Viking lander pressure relation; in VLPRES update the base date for
compatibility with the J2000 system. LAST SINGLE PRECISION VERSION.

2014mar28 Version 2.3.3 (not released)
Minor fixes to V2.3.2 routines noticed in the R*8 development:
daycom.inc   BLAY(MAXN1) >> BLAY(MAXN1P) and increase NWDAY by 1
tday.f   DIFFI(MAXN1) >> DIFFI(MAXN1P)
  "   HEAT >> HEATA   simply to make it unique
tdisk.f   INTEGER*4 HEADLEN /30/ >> INTEGER*4 HEADLEN /25/
tcard.f near 274 N1PIB.GT.MAXN1 >> N1PIB.GT.MAXN1P

2014mar23:28Code KRCN, A Crank-Nicholson solution version of the R*8 version of
TDAY8, only this file is modified, and it calls the new routine tridah8.f, which
is a modification of the Numerical Recipes routine tridag. A parallel change is
to remove all code related to time doubling, use of which would require changing

the matrix size at nearly every time step.

2014mar10:16 V3.1.1 Code KRC8, a double-precision version, keeping the same
algorithms. Major source files and routine names changed by adding a trailing 8:
---.f >> ---8.f . For a number of minor routines, kept the same name and grouped
them into a file ksubs8.f . Order of arrays in KRCCOM modified. The files for
all commons with any real variables renamed: ---com.inc >> ---c8m.f .
21 FORTRAN
files modified. Untabify most source-code files. Makefile Make8 .

2014feb28 Version 2.3.2 Released to ASU. Change Makefiles to use gfortran rather
than g77, and simplify them. [Untabify and justify most .f files; many
variables to set explicitly to REAL*4]

2014jan27 Version 2.3.0 If fatal error, rather than terminating run, KRC will
try the next case. Ensure disk files closed for unusual sequences. Use more
accurate, and slower, models for the OnePoint mode.

2013nov13 Version 2.2.4 Sent to ASU but named krc222f there. This is
the last of several variations on 2.2.2 that dealt only with the makefile, IDL
routines, and tiny format changes. All calculations are the same in all variants
of 2.2.2 and 2.2.4

2013aug30 Fix logic in tdisk when changing between file types.

2013aug26 Version 2.2.2 Revise PORB system to accommodate exoplanets and a format
for asteroids that allows cut-and-paste from the JPL small-bodies browser; most
changes are in porbel.f . Add design and Users Guide documents for
PORB. Included detailed documentation of Type 52 output file.

2013jun10:Aug05 v2.2.1 Fix bug in computing dates to match requested LS in
OnePoint mode that was introduced in 2013jan changes. Major change to PORB
system, reducing geometry matrix from 60 to 30 items; use new routines porbig.f,
which computes the geometry matrix, and porbit.f which computes geometry for a

specific time. These routines are generic for any orbit and spin axis. Mars
values now agree closely with Allison and McEwen (2000), as described
in ls.tex

2013jan30+ v2.1.2
Add version number to screen, print file , and type5x output. Defined
in filcom
Remove capability of taking input cards from terminal. Use IMPLICIT
NONE
throughout. Fix binf5 to detect CPU word order and write in .bin5 file
Update PORB system to use dates from J2000.0, dates now 11545 less
than older.
   Revise the orbit-element tables, using Standish for planet orbits.
   Change variable name: PHOXX to PHFXX , to match matrix.tex
conventions.

2013jan25 Version 1 distributed for KRC workshop at ASU Jan 28-30.
This is the
version described in H. Kieffer, Thermal model for analysis of Mars
infrared
mapping, J. Geophys. Res.: Planets, v.118, 451-570 (2013).

2012jun02 Compute cosine of incidence on level and slopes using vector
algebra.
This removes the restriction that slope normals should not be tilted
past the
spin axis, and is exact for large slopes. A few new subroutines for
vector
algebra.

2012may11 Temporary calculation of magnitude of energy lost from
system when
Tatm falls below saturation but there is no cap to which to add the
snowfall. Use FLOST in krccom and TTX4 in latcom. Then comment out
code in TSEAS
but leave the few statements in TDAY and TLATS

2012 Mar 3 06:07:45 Very scary, after many crashes (typical exceeding
MAXN4) and
 debugs, added a print statement to TDISK and it ran. Removing the
compiler
 option -fdefault-integer-8 seems to have fixed the problems.

2012 mar Develop no-atmosphere capability, which uses average annual
insolation
for initial temperature estimates; changes restricted to TLATS and
TDAY. Write
OBLIP and AVEYEAR. Discover many versions of porbcm.inc and some
porb--.f;

replace all current use except ~/krc/porb/ with soft-links. No-atmosphere is
triggered by PTOTAL of 1 [Pascal] or less. Include '|<dbug' on D-lines.
Incorporate CLIMTAU that allows read of zonal/seasonal dust and ice opacities

2011july Develop movie version, KRCm, to speed up Phils calculation of
spinning thermal planet; achieved factor of 3800. Requires use of soft links to
multiple versions of some routines

2010sep04 In tday; remove the 0.9 pad on N3 limit of DELJUL/PERIOD

2010apr21 Update 3 routines that deal with the 4 input lines related to
temperature-dependent properties: tprint, tcard, tday , giving the extension .f2
and the older versions extension .f1. Make soft links of .f to the .f2 version
Also make soft link for krccom.inc to krccom2.inc . As of this date, the base
version of KRC has the temperature-dependent option, invoked by setting LKOFT.
Add option of 3rd integer on first input line. If not 0, then will read a card
of 6 debug flags, IDB1 to IBD6, which are contained in units.inc and all are
initialized as 0 in TCARD(1)

2010jan11 Go to IMPLICIT NONE in all major routines
Change names in krccom PI>>PIVAL RAD>>RADC to improve search uniqueness
Move TINT call from tlats to tseas so as to remove 1-season delay in SUMF
Add D-line writes to FORTRAN units for study of KofT differences.

2009apr22
Begin ability to forecast deep layers based on storage of midnight values.
Scheme 1. [Coded, but not refined. Mostly a stub] Store at integral years prior
to forecast season index. If have 3 or more values, use EPREAD; should be safe
to use on all layers. Because of possible jump perturbation on the first day,
best to not have that be one of the stored dates. Does nothing if IDISK2=0. [To
remove, delete TMN4Y from hatcom, delete call to TYEARP in TSEAS, remove

tyearp.o from sources in Makefile]
Scheme 2.[Not implemented] Rolling storage of all seasons for the past year. At
forecast season; evaluate thermal delay to surface and make [complicated]
forecast.

2008nov11-2009feb MAJOR CHANGE. Add temperature-dependent conduction option
  Use L10 as logical variable for k-of-T
  Lengthen KRCCOM and move some inputs around
  recode tday to have constant and T-dependent options
  Update IDL routines that deal with KRCCOM
  Remove max # seasons restriction.

2008oct02-25
Found error in calculation of planetary temperature; was using
  hemispheric integral 1-BETA instead of exp(-Tau_IR); so in effect using tau
  that was too large by factor of tau_eff/ Tau_IR.
Modify: krc.f tseas.f tlats.f tday.f tdisk.f tprint.f tcard.f
 krccom.inc daycom.inc
Use slope azimuth as a flag for a pit of slope SLOPE.
Put in proper SKYFAC for conical pit.
Allow for Snow formation in cold atmosphere and fall to surface.
Move MAXBOT from daycom.inc to krccom.inc.
Replace ID22(1) and (2) with KVALB and KVTAU.
Move AMW fixed value in tlats.f into krccom in place of ABRAMP
  move other physical and hardware-dependent constants into krc and krccom.
Add output file type 56 in tdisk.
Replace dual use of GGT by using new DTMAX for daily convergence.
Major modification of output Type 52.
Use IDOWN as season index at which to read some changes

2006sep09 Allow seasonally variable albedo and TauD.
  three new routines: seasalb, seastau, readtxt360;
  and changes in tseas and tcard and filcom.inc

2006sep09 tcard Correct error: REAL*4 LSUBS should have been ALSUBS

2006apr30 tdisk Add TTB4 to type 54 output

2006apr22 tdisk Allow flexible number of cases for output file type 52 and 54

2006apr12 tdisk Change file style 54 to have both 1 am and 1 pm surface Temp.

2006jan25 tlats Modify SKYFAC from linear with slope to (1+cos s)/2

2005dec28 tlats Fix bug using ZENLIM. Additional comments

2005nov19 tprint Add print of depth to top of 2nd layer

2005nov18 tlats Add optional solar zenith angle limit

2004sep30-Oct5 tday.f tdisk.f Add storage of surface downward fluxes
every hour
on last day. Revise file style 52 to include them (and a spare
variable).

2004sep28 tlats.f Add tests to avoid round-off to negative fluxes at
night so
code would run at ASU

2004sep28 porb.f Change name of called routine ROTATE to ROTVEC to
avoid library
conflicts

2004jul06 tdisk Add file style 54 Add the Common HATCOM

2002nov01 tseas.f Have DJU5 increment by current DELJUL for each
season

2002aug04 tdisk.f Add output file type 53=(combo at 1 lat, 2+80
seasons, 10
cases). Recode logic

2002jul12-17 Incorporate Delta-Eddington atmosphere. Found that double
precision
is required within deding2.f

2002mar07 krc.f tcard.f Major change. Add option for "one-point" rapid
runs for
Surface T

2002mar07 alsubs.f Created. Adopted from l_sub_s.pro

1999dec krc.f tcard.f Add option to continue from current condition

98sep01-07 Add section to TDISK for output of bin5 files type 51 and
52. Minor
code cleanup, avoiding divide-by-zero if atmosphere parameters were
zero Make
KRC/moon version of TLATS and TDAY by removing all atmosphere code,
and
including eclipse section in TLATS; commons left the same even though
atmosphere results not calculated.

1997sep idlkrc.f Build this IDL interface to call KRC.

97fall-98summer Incorporate one-layer atmosphere with many parameters that can
be tuned to mimic Haberle-Jakosky model. First-order treatment of scattering of
solar radiation. Diurnal temperature is modeled as sinusoidal with phase
shift. Wrote LaTeX description. Build TES look-up code for computation of
thermal inertia from TES observations; this interfaces with Mike Mellon model
set.

97jul Go from cal-cm units to all SI except for use of days

88sep08 .MARS]TDAY: Test moving layer T limit tests and metamorph. from N24
         into each time loop; so that they are done 1536 instead of 40 times
         per "day". Negligible effect; <.01 degree in TMETA.

87nov22 TCARD: Add report if input integers are reset into valid range.
           NMHA no longer constrained.
         TPRINT: redo some formats.
         TDAY: Add error report if convergence is unstable.
         KRC: set IOERR=IOPM rather than IOSP.
        Force parameter print through call to TPRINT(2) if TDAY(1)
error occurs.
         .MARS]TLATS: now includes variance tests.

87nov22   .YEAR] versions of DAYCOM and LATCOM with larger MAXN24 and MAXN2
         meant for use with TYEAR.
         Most routines compiled into .YEAR] with the these.
         Will need to redo TDISK if it is to be used.

87oct01 ALL Separate the use of NMHA for storage and N24 for printout.
         TLATS: replace CFSOLAR with AVEDAY.

87sep11 .MARS] TDAY & TLATS: Special versions for metamorphism.
           Use ZLAT(17:19) for input of metamorphism and sublimation
constants.
           Use TT(J,MAXN3) to transfer metamorphism rate.
           TYEAR: version of TLATS which averages daily insolation and
includes
             PORB in the insolation calculation. Uses AVEDAY.

87jun30 TDAY: Avoid /0 if DTMJ(JJJ)=0 at "done" test.

87mar29 Remove incorporation of albedo in the solar incident flux
ASOL.
         Add ADGDIF (diffuse solar flux) to KRCCOM.INC.
         Recompile TLATS,TDAY, Link.

86oct   Paul finds erroneous factor of PI in computing coma diffuse
radiance;
         change made to source code only, not linked.

85oct14 Add COMMON FILCOM of file names; print these in TPRINT.
         Change meaning of FROST4 and AFRO4 for comet.
         Minor changes in printout sequence.
         Change TYPE to WRITE(IOPM in TDISK.

85sep05-07 Combine the comet and mars versions into single routines
which use
         the larger LATCOM. Only external change is reversing the
meaning of
         LD18. Major restructuring of TLATS and TDAY to accommodate
both comet
         and Mars; use LD20 .TRUE. if Mars, .FALSE. if comet. Other
routines
         needed no changes.
         Revise HELPLIST.
         Create directory KRC.COM] for the comet-particular stuff. Move
older
         routines for .KRC] to .KRC.COM]. Move all the routines which
support
         both comet and mars from .KRC.MARS] to .KRC].
         Delete plot routines dating from 1984 which used the smaller
LATCOM.

85May~10-14.   Dave Paige visits Flagstaff. We create new directory
         [hkieffer.krc.mars] in which MARS version of code is put. MARS
version
         has larger LATCOM (JLAT changed to real*4). HELPLIST revised.
           After Dave left, found that TDISK had not had JLAT change,
         hence was not writing LATCOM to disk.
         Made new plot version, starting with 84jun comet version, but
with
         almost entire revision using NCAR_1 routines, including new
         MCURVE1, CONREC1 and GO1. Never got all the bugs out.

85Jun24-28 Paul Weissman visit. Found error in COMA2, otherwise no
changes
         from Jun 84 comet version. Linked and ran and duplicated
older runs.

circa 1980. Comet Version. See: P.R. Weissman and H.H. Kieffer,

Thermal
modeling of cometary nuclei, Icarus, v. 47,pp 302–311 (1981).
Includes model for
opacity, scattering, and emission of dust coma based on mass of ice
sublimated
in last season. Computes non-gravitational acceleration terms.
Moving
numerical grid to keep it in fixed relation to surface which is
subliming or
condensing.

circa 1968. Original code: Used for analysis of Mariner 6, 7, 9 and
for planning
and analysis of the Viking missions. Described in: H.H. Kieffer et
al., Thermal
and albedo mapping of Mars During the Viking primary mission,
J. Geophys. Res.,v. 82, 4249–4291 (1977)