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KRISSY: user's guide to modeling three-dimensional wind flow in complex terrain

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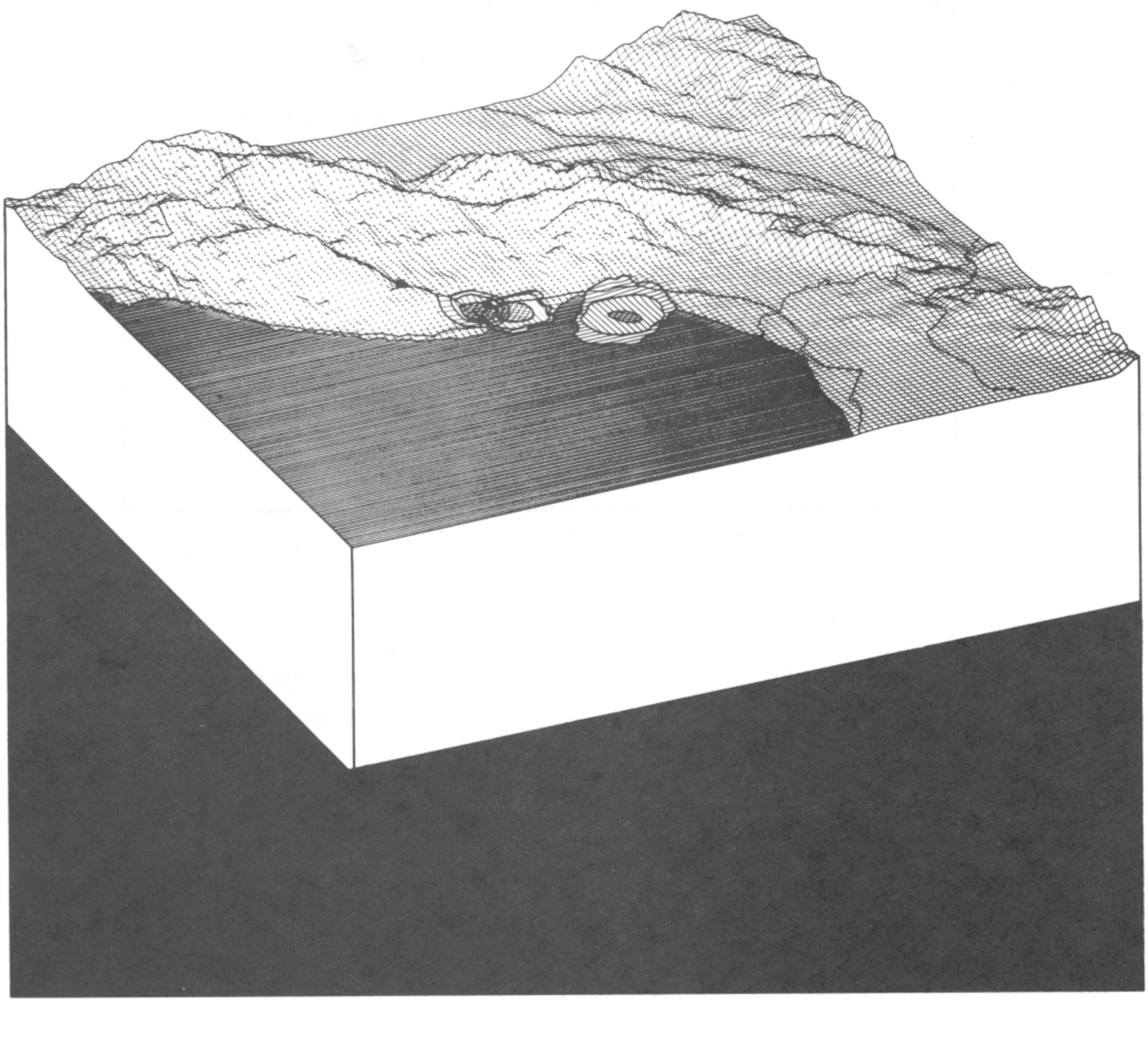

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KRISSY is a computer model for generating three-dimensional wind flows in complex terrain from data that were not or perhaps cannot be collected. The model is written in FORTRAN IV This guide describes data requirements, modeling, and output from an applications viewpoint rather than that of programming or theoretical modeling. KRISSY is designed to minimize meteorological requirements—particularly for upper air data. It also includes a program option that derives vertical motion from a solution of the wave equation with momentum conservation. KRISSY differs from other mass-conserving wind flow models in these features and, therefore, is applicable to a broader range of meteorological conditions.

Retrieval Terms: wind flow models, computer program, meteorology

KRISSY: user's guide to modeling three-dimensional wind flow in complex terrain

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Cover: Computer simulation of long range transport of gypsy moth larvae from a source north of Santa Cruz, California. The three dimensional wind patterns were produced by KRISSY.

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INTRODUCTION

KRISSY[1] is a mass-conserving, three-dimensional wind flow model for complex terrain. The model uses observed data from scattered surface and upper air stations to generate within a rectilinear grid a full three-dimensional wind field depiction at points where measurements were not or perhaps cannot be taken.

This guide to KRISSY is designed to aid the meteorologist or other specialist who requires the generation of three-dimensional wind fields from sparse data. It focuses on data requirements, setup, and output of the model. Neither the mathematical theory nor the computer implementation technique of the model are described. Mathematical or computational techniques are discussed only in terms of constraints and options to the user.

The KRISSY model is written in FORTRAN IV and was tested on an IBM 3090 computer. We attempted to remain as close as possible to standard FORTRAN, but differences in implementation of even standard features sometimes occur between machines. Potential problems in transferring the code to another machine are, therefore, briefly described.

The KRISSY program is available upon request to:

Computer Services Librarian
Pacific Southwest Forest and Range Experiment Station
P.O. Box 245
Berkeley, California 94701

Send a reel of one half-inch computer tape with your request. Specify the program you want and include any instructions for writing the tape. Blocked tapes of the source codes and data can be written ASCII or EBCDIC.

If you use a computer in the Forest Service's distributed processing system and are connected to the U.S. Department of Agriculture Network (DPNET), you can contact the Station's Statistics and Computer Services at network address SCS:S27A and request instructions for retrieving KRISSY files. Mail to this address may be routed through your regional CEO mailroom.

CHARACTERISTICS OF THE MODEL

The KRISSY model is based on the MATHEW model of Sherman (1978) and modified by Davis and others (1984) to a terrain following a coordinate system. Three improvements have been introduced in the KRISSY model: compressible flow was introduced, the interpolation technique was changed to one more suitable for use with sparse data, and a mountain wave equation was added in the calculation of vertical motion with conservation of momentum. This latter change allows the study of situations such as severe downslope winds in complex terrain. Also, the results can be presented in either terrain following coordinates, where each vertical level is a constant distance above ground level, or in Cartesian coordinates, where each vertical level is a constant distance above mean sea level. The model concepts, equations, and performance characteristics were described in earlier publications by Fosberg (1984, 1985b).

Compressibility was introduced into the solution by allowing the density in the steady-state continuity equation to be space dependent. The initial density variation is determined primarily by the temperature field generated by interpolation from the upper air soundings.

The second modification to the model is in the method of interpolation. Interpolation is used to convert the wind and temperature observations from scattered stations to a first estimate of the three-dimensional grid of the wind components, u, v, and w as well as the temperature and pressure fields. The MATHEW model uses Cressman's (1959) $1/R^2$ interpolator for surface wind data and for upper air observations by locating each upper air station over the nearest surface station. The KRISSY model uses a straight $1/R^2$ interpolation of the data for only the surface stations. KRISSY modifies a technique of Goodin and others (1979, 1980) for the upper air stations. These observations are used directly at the locations of each upper air station but the profiles are used to calculate the vertical derivatives of the variables to be interpolated. These vertical derivatives are then interpolated using the $1/R^2$ method. Profiles are then reconstructed at each grid point for the levels to be modeled to provide the initial data fields. This technique reduced the model data requirements, particularly for upper air observations. Information is significantly greater about the real variation of the meteorology in the vertical derivatives of the soundings than in the spatial variations between soundings.

Both Sherman's MATHEW model and the later derivative ATMOS 1 neglect momentum transport in their set of governing equations. Also, both calculate the vertical motion as a residual variable. Because applications such as severe downslope winds require a model that addresses momentum conservation, a procedure was sought to introduce a mountain wave solution into the ATMOS 1/MATHEW solution. In the most desirable solution, the wave equation would be contained in the expression of vertical motion. Crapper (1959) developed an analytical solution for the three-dimensional mountain wave, but this solution did not meet the specific requirements of model development. Onishi (1969) adapted Crapper's analytical model to a numerical solution that more closely meets the needs for introducing momentum into KRISSY and is essentially the solution in the model.

[1]KRISSY is not an acronym, but named after the senior author's daughter.

The model is intended for mesoscale applications where the distance between adjacent grid points is at least 200 m and can range up to several kilometers. With larger grid scales, the lack of terrain information reduces model effectiveness. For smaller scales, the physics of the model are not appropriate. Also, one constraint occurs on the size of the area to be simulated due to the algorithm that solves the differential equations. The number of grid points in the north-south direction must be a number of the form 2^{k-1} (where k is any positive integer), such as 7, 15, and 31. For the vertical resolution, the amount of detail available in the upper air soundings will largely determine how many lev-els can be discriminated. This constraint refers primarily to the upper air wind profiles, since the program defaults to the U.S. Standard Atmosphere if no temperature profiles accompany the wind profiles. Placement of the vertical levels to be modeled is arbitrary; they are not required to be evenly spaced. Thus, levels can be closely spaced where detailed information is desired and widely spaced at others. Placement of levels depends on the application. The finest vertical resolution is probably on the order of 30 to 50 meters.

DATA REQUIREMENTS

The KRISSY model uses three types of input data: model control and site description parameters, terrain elevations, and meteorological observations. Guidelines for the number of surface and upper air stations or their locations are described (Fujioka, 1985). In addition, the user should maintain certain meteorological practices to obtain reasonable results. As with any diagnostic model, the greater the input, the better the expected results. These results, of course, must offset the cost of obtaining additional observations. Also, one must consider boundary conditions when choosing stations or siting them. Good results are not expected if all stations are clustered. Also, if the terrain is dissected into discrete sections having potentially different wind patterns, at least one station should represent each section. Moreover, stations should represent the conditions near the dissecting topographic feature. Since this is a three-dimensional model, at least one upper-air wind profile is required. These are general considerations which must be assessed in terms of station placement and their effects on boundary conditions even though no actual model constraints enforce them.

Missing data occurs in any measurement program. However, many models operate only on a complete data set. The procedure by which a model handles missing data is therefore very important. In the case of KRISSY, a specific code indicates missing data for each meteorological variable. The initial fields for each variable are generated within the model by an objective analysis routine. Therefore, when a missing value code is encountered in the data stream for a particular variable, it is simply ignored. The objective analysis is then performed using all good values entered. As with station number, the greater the data, the better the results. The program does not, however, contain any other data validation checks. Quality control of the observations should be made before they are entered in the model, and bad observations should be converted to missing data codes.

Terrain

Basic terrain data consists of an elevations file at each point on the grid for the area where a wind field is to be generated. The elevations can be entered in meters or feet. A numerical code indicates if the data requires conversion to meters. The elevations file should be organized so that the first line starts at the north end of the study area and each line proceeds south. Individual elevations on each line should proceed from west to east. Again, the number of grid points in the north-south direction must be dimensioned as 2^{k-1} (where k is any positive integer).

Each elevation is specified at the intersection of grid lines in some rectilinear (Cartesian) coordinate system. One of the best coordinate systems for this purpose is the Universal Transverse Mercator coordinates (UTM) on U.S. Geological Survey (USGS) maps which specify distances on a 1-meter grid. For this model, it is more convenient to consider UTM's every kilometer (that is, the interval at which they are recorded on maps of 1:24000 scale, as commonly used in regional studies). Each surface and upper-air meteorological station must also be specified in the same coordinate system as the elevation grid. Two parameters are required to define the relation between the standard coordinates and the grid spacing along the north-south and east-west direction in order to record station locations in UTM's or other standard coordinate systems.

A record containing control information is needed with the elevation file. The first parameters in this record define the distance in meters between grid points in the north-south and east-west directions. Next, the origin of the grid—the southwest corner—must be specified in the coordinate system to locate meteorological stations. Then, the elevation is given, which serves as a base to report the results of each upper level in the atmosphere when Cartesian (rather than terrain) coordinates are specified for output. If this level is set to zero, the minimum terrain elevation is automatically selected as the base elevation. Otherwise, it can be set to specific upper levels at round elevations above mean sea level (MSL). Finally, the parameters that describe the relation between the spacing of the elevation grid and the coordinate system must be given. For example, if the coordinate system is based on UTM's in kilometers and the elevation grid spacing is 500 meters, the spacing parameter must be specified as 2.0. Using the same coordinate system and an elevation grid spacing of 2 km, the spacing parameter is 0.5. The spacing parameter converts the absolute coordinate system to array indices. The spacing can be independently specified for the north-south and east-west directions.

Although it may not seem so initially, obtaining a data base of elevations for the study area can be the most difficult task in a large project. For the United States, computer tapes are available from the National Geophysical and Solar-Terrestrial Data Center, National Oceanic and Atmospheric Administration (NOAA), Boulder, Colorado (Dietrich and Childs, 1982). The minimum distance between points on these tapes is 30 seconds latitude and longitude. This is not precisely a rectangular grid; but for an area not too large, the error in fixed linear distances is about 1 percent (900 m per 100 km). The largest error, resulting from the difference in distances between the 30 sec latitude and longitude, is compensated by allowing a different grid spacing in the east-west and north-south directions. Digitized maps of finer resolution are available from companies that supply data to mineral exploration firms. These companies will often digitize new areas. Finally, one can always draw a grid over a mapped area and tick off elevations, especially if the study area is relatively small.

Surface Meteorology

The meteorological observations required for each surface station are windspeed, wind direction, and temperature. The elevation (in meters or feet) and location of each station (in any rectilinear coordinate system such as UTM's) are also required. Wind direction is entered in degrees from the north. Windspeed is entered in any common unit: m/s, mi/h, km/hr, or knots. As with other variables, an appropriate conversion code allows the model to accept any input/output units, although m/s units are used internally. Temperature is input in degrees Celsius (C), Fahrenheit (F), or Kelvin (K) and is converted to potential temperature for use within the model. Potential temperatures can also be entered. A special flag on the station observation record indicates if potential or thermodynamic temperature is used. Since the surface and upper air stations are entered together in the same format, another flag indicates if a record is from a surface or an upper air station.

Upper Air Meteorology

Since KRISSY is a three-dimensional model, at least one upper air profile is required to interpolate the wind field. Because the interpolated winds are derived from the vertical derivatives of the observations, at least one sounding should extend to the height of the highest terrain plus the highest level to be modeled. This prevents the usually stronger low-level wind shear from being propagated into the upper levels. As with surface observations, the interpolation is aided by as many soundings as possible, up to the highest level. An actual temperature profile allows calculation of the space-dependent density to account for compressible flow. However, if temperature profiles are not available, the model provides the U.S. Standard Atmosphere as a default. Each upper air observation is placed on a single record in the same format as a surface station observation. However, all records for a single upper air station must be consecutive and ordered from lowest to highest levels. Also, the elevation must be expressed as height above sea level. As for surface stations, one flag indicates potential or thermodynamic temperature and another flag indicates surface or upper air stations.

MODEL RESULTS

Printed Results

The model printout is in five parts: data list, model results, error statistics, vertical cross-section model results, and divergences. The first part is a listing of input data. The second part consists of model results, listing wind direction, windspeed, potential temperature, and vertical motion for all grid points on each desired level. If the output specification for vertical motion is for units of cm/s or ft/min and the output exceeds the three-digit range of the print format, the program automatically defaults to m/s or hundreds of ft/min, as appropriate. The output units for each variable are listed at the head of the model results. Before listing model results, the space averaged profile of the wind components, potential temperature, and stability (Scorer l^2, see Fosberg 1984) are printed if the momentum conservation solution is specified. This listing serves primarily as a diagnostic of internal calculations and verifies any significant impact by stability or momentum transport.

Third, errors statistics are calculated for all of the observations. This listing of the model results, observations, differences, and some simple statistics provide a simple summary of the model's reliability. Fourth, vertical cross sections of the model results of the wind components and the potential temperature are listed to assist the user in analyzing the model results.

The fifth part consists of the three-dimensional divergence printed as an error check on the mass balance calculations. Not all applications need a printout, in which case a user option creates only a file containing the wind field components. The only printed output is a data list and the modeled wind error statistics of the input, the model options, and any run stream error messages.

Mass Storage Files

Three-dimensional data are difficult to assimilate in tabular form. Therefore, they are often converted to contour plots or other graphic forms, or used in other models that require three-dimensional wind field input. For this reason, the elevations, wind components, and potential temperature can be written to a disk or tape storage file for further processing. In the current version, three-dimensional data are written to this file line by line, layer by layer, using a (22F6.1) format.

MODEL RUN SETUP

Three steps must be completed to run the KRISSY model. A data file must be built, the dimensions and several control parameters in the main program must be set, and the appropriate job control code must be produced. This manual deals principally with the first two steps. Since each job control code is designed for specific operating system, only basic data about the model can be supplied. These data must then be tailored to each operating system's unique job control code.

Data Setup

All model input is read from a single input unit. Therefore, from a data management standpoint, it may be convenient to store the data in more than one file and merge these at run time; the data input is described as a single file. In some cases, logical breaks for file management are described. However, the following line-by-line description shows how the data would appear in a single file. Some lines describe a block of data, all of which have the same format as the meteorological data. In these cases, the type and extent of the data required are indicated.

Upper air and surface stations lack separate data formats. Both use the same format and may be interspersed within their section of the file. However, a restriction is placed on how the observations for each upper air station are entered. The observations for each level of an upper air station are coded on separate lines, as if individual surface stations. All lines for an individual sounding must be consecutive and ordered from the lowest to the highest level above ground. This facilitates the calculation of vertical derivatives for the objective analysis routine. If the data are not so organized, the observations for upper air stations will not be correctly recognized and the objective analysis will have no vertical derivatives.

Many input variables can be entered in a number of measurement units. For these variables, a code indicates conversion from recorded units to those used within the model:

Code	Data input conversion
0	No conversion, data in model units
1	No conversion, data in model units
2	Feet to meters
4	Degree F to degree K
5	Degree C to degree K
8	Knots to m/s
9	mi/h to m/s
10	km/h to m/s
	Data output conversion
3	Meters to feet
6	Degree K to degree C
7	Degree K to degree F
11	m/s to knots
12	m/s to mi/h
13	m/s to km/h
14	cm/s to m/s
15	m/s to cm/s
22	m/s to ft/min
23	m/s to 100 ft/min

Table 1—*Allowed unit conversions*

Variable	Input units	Model units
H (agl)[1]	Feet, meters	Meters
ELEV (msl)[2]	Feet, meters	Meters
ZORG (msl)[2]	Feet, meters	Meters
SPD[3,4]	mi/h, km/h knots, m/s	m/s
DIR[3,5]	Degrees	
TMP[5]	Degrees C, F, K	Degrees K
ZPT (msl)[2]	Feet, meters	Meters

[1]Above ground level.
[2] Mean sea level.
[3] Converted to u and v wind components.
[4] Missing code: -9.9.
[5] Missing code: -99.

Table 1 lists the variables, input units, model units, and code for missing data.

The format of each input data line for the model is specified in *table 2*. Some formats are designed for an entire model input segment. Some formats are designed for an entire segment of record input, such as the elevation grid and meteorological data. Each segment of more than one line is described along with the format for each line of that block.

Line 1 represents the input format for the first 8 model elevations. For more than 8 levels, additional data lines are required.

Line 3 represents the input format for the entire elevation grid, though it gives the format for only one record of 10 grid points. A single grid line may require multiple data lines. A series of grid lines certainly requires multiple data lines, since each grid line must start at the beginning of a new data line. The grid of elevations is entered in lines from north to south and from west to east across each line.

Line 6 describes the format for all meteorological, surface, and upper air data. Each surface station is one line in this format. Each level of an upper air observation is a single line in this format. Upper air and surface stations may be intermixed, but all observation lines for an upper air station must be consecutively ordered from the lowest to highest level.

The model accepts input data in any unit commonly used for required observations. Output can be in the same units or converted. Internally, the model expresses all speeds in meters per second, lengths in meters, temperatures in degrees Kelvin, and pressures in Pascal. The conversion codes specified above are used to convert to model units. As noted, the conversions are reversed for output options.

Main Routine

Two changes must be made when setting up a new problem: redimensioning arrays and setting control variable values. Since the program uses variable dimensioning and two- and three-

Table 2—*Input data formats*

Line	Variable	Column	Format	Description
1	H	1-80	(8(5X,F5.0))	Height (m) above ground of upper levels to be modeled, first level must be the surface (0.0)
2	INV	2-3	12	Conversion code for terrain elevations units
2	JMPRND	11	L1	Indicator, T = MATHEW, F = momentum solution
2	TFAL	13	L1	Indicator, T = terrain following, F = Cartesian coordinates
2	NUPOB	15-16	12	Number of upper air profiles
2	INZ	18-19	12	Conversion code for vertical levels and z origin units
2	MSFILE	21	L1	Indicator, T = mass storage files only, F = printed output also
3	ELEV	1-80	(10(2X,F6.1))	Elevations MSL at each grid point
4	DX	9-16	F8.2	Meters between grid points in east-west direction
4	DY	18-25	F8.2	Meters between grid points in north-south direction
4	XORG, YORG	27-48	F10.2,2X F10.2	Location of the southwest corner of the grid, such as UTM
4	ZORG	51-56	F6.2	Base from which upper level heights are calculated, if zero, lowest terrain elevation is used
4	NSUBX, NSUBY	59-73	F6.2,2X F6.2	Conversion factors from data coordinates to array indices[1]
5	HDR	1-80	40A2	Header for printed output describing model run, location, or meteorological data used
6	DIR	1-4	F4.0	Wind direction (degrees)
6	SPD	9-11	F3.1	Windspeed
6	IVOB	13-14	12	Conversion code for windspeed units[2]
6	TMP	16-19	F4.1	Temperature
6	ITMOB	21-22	12	Conversion code for temperature units[2]
6	XPT,YPT	34-49	F6.2,5X, F6.2	Location of station in the coordinate system such as UTM's
6	ZPT	54-59	F6.2	Elevation of station above sea level
6	IZOB	61-62	12	Conversion code for units of station elevation
6	TTYPE	64	L1	T = potential temperature; F = thermodynamic temperature
6	SFC	66	L1	T = surface station; F = upper air station
7	-999	1-4	F4.0	End of data indicator

1 See "Data Requirements" for description of coordinate system.
2 See "Model Run Setup" for conversion codes and values.

Table 3—*Main routine variables to be reset*

Routine variable	Function
II	Number of grid points in the east-west direction.
JJ	Number of grid points in the north-south direction; must be in the form 2^{k-1}, where k is any positive
KK	Number of vertical levels to be modeled.
NMOBMX	Maximum number of meteorological observations expected (anything greater than or equal to the total number of meteorological observations in order to reserve array space).
IOUT	Conversion code for units of output of horizontal windspeed. Converts internal m/s of model to desired output units.
IWOUT	Conversion code for units in vertical windspeed output. Converts internal m/s of model to desired output units. If cm/s of ft/min are specified and the results exceed the output format, the model automatically defaults to m/s or hundreds of ft/min.

dimensional arrays, the dimensions in the main routine must be set to the grid size in each new problem. Variables representing these array dimensions *(table 3)* and other options must be initialized in the main routine. The dimensions of the arrays must be initialized in the main routine. The dimensions of the arrays must be changed along with the variables which correspond to each index of the arrays *(table 4)*. The key variables are:

Main arrays	Interpretation
ELEV	Gridded terrain elevation
U	Gridded wind vector in the east-west direction
V	Gridded wind vector in the west-east direction
W	Gridded vertical motion
THETA	Gridded potential temperature
H	Height of compilation levels

Job Control

Three elements are required to produce job control instructions to run the KRISSY model: the FORTRAN input/output unit numbers accessed, the amount of memory required, and total execution time of the job.

All input is from unit 1. Printed output goes to unit 2. The elevation wind components u, v, and w, and potential temperatures are written to unit 4 and stored in a permanent data file.

For example, on the IBM 3090 at the University of California at Los Angeles, a sample run with 15 by 22 grid and 7 levels required about 300 K bytes of memory and was executed in 10 CPU seconds, for a total cost of $1.50. This includes model compilation time.

Table 4—*Main routine arrays requiring redimensioning*

ELEV(II,JJ,KK)	U(II,JJ,KK)	V(II,JJ,KK)
W(II,JJ,KK)	THETA(II,JJ,KK)	P(II,JJ,KK)
DIVG(II,JJ,KK)	WNDSPD(II,JJ,KK)	WNDDIR(II,JJ,KK)
SIGMA(II,JJ,KK)	UPR(II,JJ,KK)	VPR(II,JJ,KK)
DUMMY(II,JJ)		
AM(II)	AN(JJ)	H(KK)
BM(II)	BN(JJ)	UBRR(KK)
CM(II)	CN(JJ)	VBRR(KK)
BMS(II)	BNS(JJ)	THBRR(KK)
		LSQ(KK)
		HO(KK)
DIR(NMOBMX)	SPD(NMOBMX)	TMP(NMOBMX)
XPT(NMOBMX)	YPT(NMOBMX)	ZPT(NMOBMX)
UOB(NMOBMX)	VOB(NMOBMX)	IVOB(NMOBMX)
ITMOB(NMOBMX)	IZOB(NMOBMX)	ZU(NMOBMX)
ZV(NMOBMX)	ZTH(NMOBMX)	TTYPE(NMOBMX)
SFC(NMOBMX)		

PROGRAM STRUCTURE

The KRISSY model program consists of three basic routines: the main program, subroutine WNDMO, and subroutine BLKTRI. The main program sets up the array dimensions and initializes some model parameters. Subroutine WNDMO, the main model subroutine, contains the basic model logic and controls the calculations. The final group of routines are used by WNDMO to perform the detailed model calculations. All arrays pass from the main routine to the subroutines using variable dimensions. Therefore, when the program is set up for a new problem, only the main routine needs to be changed and recompiled. All other routines are compiled once, stored, and linked at run time.

All but one set of subroutines use standard variable dimensioning where the array name and its dimensions are sent as arguments through the subroutine call statement. Subroutine BLKTRI and the routines it calls are an elliptic differential equation solver obtained from the National Center for Atmospheric Research (NCAR), Boulder, Colorado. This routine does not use the call arguments to redimension the arrays, but sets all array dimensions to one. It then uses the array dimension argument to index the array, assuming it was properly dimensioned in the calling routine. This is compatible with all FORTRAN compilers, since they send only the address of the first element of the array to the subroutine. However, few compilers copy the array to a temporary location when a subroutine is called, then copy the results back to the original array when the subroutine exists. If, as in BLKTRI, the dimensions in the subroutine are less than in the calling routine, only part of the array is copied and available for manipulation. Access beyond the dimensions in the subroutine results in exceeding array bounds and creating error messages or the changing of variables not intended. Therefore, in its present format, BLKTRI does not work with this type of compiler. Also, BLKTRI takes into account that even if the initial index of a DO loop is larger than the final index, FORTRAN IV always goes through the loop at least once. In FORTRAN 77, the code within a loop is executed only while the loop control index is less than or equal to the final index. Therefore, the KRISSY model cannot be converted for use on a FORTRAN 77 compiler without major revision of the BLKTRI routine.

ERROR MESSAGES

All error messages *(table 5)* are written to the same unit as the printed output. This unit should be specified in the job control stream for output, even if printed output is not required, to isolate any program errors. Error messages signal program faults and briefly describe the causes.

Table 5—*Error messages*

Error message	Cause
WARNING ON KK DIMENSION	The number of vertical levels speci fied in the main program is less than 4. It warns that the momentum solution cannot be used in this case, but the ATMOS 1 solution can.
KK IS TOO SMALL FOR THE MOMENTUM TRANSPORT SOLUTION	The momentum solution is specified and the vertical level is less than 4. The program halts. No solution is possible with this specification (in WNDMO).
ERROR IN BLKTRI, IERROR = X	BLKTRI returns an error code other than zero. The program is halted. The cause of each error code follows.
IERROR = 1	The east-west dimension (II) is less than 2.
IERROR = 2	The north-south dimension (JJ) is not of the form 2^{k-1}, k being any positive integer.
IERROR = 3	This message should never occur for this use of BLKTRI.
IERROR = 4	BLKTRI failed while computing re sults which depend on coefficient arrays AN, BN, and CN. Check these arrays.
IERROR = 5	The maximum east-west dimension specified (IDIMY) is less than the actual east-west dimension specified (II).

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