```
---------------------------- jModeltest 0.1.1 ----------------------------
(c) 2008 David Posada, Department of Biochemistry, Genetics and Immunology
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--------------------------------------------------------------------------
Wed Oct 19 16:44:54 CEST 2011  (Mac OS X 10.6.8, arch: x86_64)


****************************** NOTICE ***********************************
This program may contain errors. Please inspect the results carefully.
*************************************************************************

Reading data file "Glacuoreseda_ITS_ITS1.nex"... OK.
  number of sequences: 17
  number of sites: 7
Reading data file "Glacuoreseda_ITS_58S.nex"... OK.
  number of sequences: 17
  number of sites: 152


-----------------------------------------------------------------
*                                                               *
*        COMPUTATION OF LIKELIHOOD SCORES WITH PHYML            *
*                                                               *
-----------------------------------------------------------------

Settings:
 Phyml version = 3.0
 Candidate models = 24
  number of substitution schemes = 3
  including models with equal/unequal base frequencies (+F)
  including models with/without a proportion of invariable sites (+I)
  including models with/without rate variation among sites (+G) (nCat = 4)
 Optimized free parameters (K) = substitution parameters + 31 branch lengths + topology
 Base tree for likelihood calculations = ML tree

Maximum likelihod estimation for the JC model.
  ML optimized tree topology
   Model = JC
   partition = 000000
   -lnL = 217.8405
   K = 32
  Computation time = 00h:00:00:02  (00h:00:00:02)

Maximum likelihod estimation for the JC+I model.
  ML optimized tree topology
   Model = JC+I
   partition = 000000
   -lnL = 217.8371
   K = 33
   p-inv = 0.9920
  Computation time = 00h:00:00:01  (00h:00:00:03)

Maximum likelihod estimation for the JC+G model.
  ML optimized tree topology
   Model = JC+G
   partition = 000000
   -lnL = 217.8407
```

```
   K = 33
   gamma shape = 62.1850
  Computation time = 00h:00:00:01  (00h:00:00:04)

Maximum likelihod estimation for the JC+I+G model.
  ML optimized tree topology
   Model = JC+I+G
   partition = 000000
   -lnL = 217.8362
   K = 34
   p-inv = 0.9880
   gamma shape = 0.2000
  Computation time = 00h:00:00:05  (00h:00:00:09)

Maximum likelihod estimation for the F81 model.
  ML optimized tree topology
   Model = F81
   partition = 000000
   -lnL = 216.4763
   K = 35
    freqA = 0.2418
    freqC = 0.2615
    freqG = 0.2942
    freqT = 0.2026
  Computation time = 00h:00:00:01  (00h:00:01:00)

Maximum likelihod estimation for the F81+I model.
  ML optimized tree topology
   Model = F81+I
   partition = 000000
   -lnL = 216.4729
   K = 36
    freqA = 0.2418
    freqC = 0.2615
    freqG = 0.2942
    freqT = 0.2026
   p-inv = 0.9920
  Computation time = 00h:00:00:01  (00h:00:01:01)

Maximum likelihod estimation for the F81+G model.
  ML optimized tree topology
   Model = F81+G
   partition = 000000
   -lnL = 216.4765
   K = 36
    freqA = 0.2418
    freqC = 0.2615
    freqG = 0.2942
    freqT = 0.2026
   gamma shape = 62.1850
  Computation time = 00h:00:00:01  (00h:00:01:02)

Maximum likelihod estimation for the F81+I+G model.
  ML optimized tree topology
   Model = F81+I+G
   partition = 000000
   -lnL = 216.4719
```

```
   K = 37
    freqA = 0.2418
    freqC = 0.2615
    freqG = 0.2942
    freqT = 0.2026
   p-inv = 0.9880
    gamma shape = 0.2000
  Computation time = 00h:00:00:05  (00h:00:01:08)

Maximum likelihod estimation for the K80 model.
  ML optimized tree topology
   Model = K80
   partition = 010010
   -lnL = 216.7429
   K = 33
   kappa = 1976.1119 (ti/tv = 988.0560)
  Computation time = 00h:00:00:01  (00h:00:01:08)

Maximum likelihod estimation for the K80+I model.
  ML optimized tree topology
   Model = K80+I
   partition = 010010
   -lnL = 217.8371
   K = 34
   kappa = 1.0000 (ti/tv = 0.5000)
   p-inv = 0.9920
  Computation time = 00h:00:00:01  (00h:00:01:09)

Maximum likelihod estimation for the K80+G model.
  ML optimized tree topology
   Model = K80+G
   partition = 010010
   -lnL = 216.7431
   K = 34
   kappa = 1996.2797 (ti/tv = 998.1399)
   gamma shape = 62.1850
  Computation time = 00h:00:00:01  (00h:00:02:01)

Maximum likelihod estimation for the K80+I+G model.
  ML optimized tree topology
   Model = K80+I+G
   partition = 010010
   -lnL = 216.7398
   K = 35
   kappa = 83714.1792 (ti/tv = 41857.0896)
   p-inv = 0.9810
   gamma shape = 0.1500
  Computation time = 00h:00:01:00  (00h:00:03:01)

Maximum likelihod estimation for the HKY model.
  ML optimized tree topology
   Model = HKY
   partition = 010010
   -lnL = 215.3764
   K = 36
    freqA = 0.2415
    freqC = 0.2617
```

```
    freqG = 0.2942
    freqT = 0.2026
   kappa = 2024.1056 (ti/tv = 1009.6913)
  Computation time = 00h:00:00:01  (00h:00:03:02)

Maximum likelihod estimation for the HKY+I model.
  ML optimized tree topology
   Model = HKY+I
   partition = 010010
   -lnL = 216.4729
   K = 37
    freqA = 0.2418
    freqC = 0.2615
    freqG = 0.2942
    freqT = 0.2026
   kappa = 1.0000 (ti/tv = 0.4989)
   p-inv = 0.9920
  Computation time = 00h:00:00:01  (00h:00:03:03)

Maximum likelihod estimation for the HKY+G model.
  ML optimized tree topology
   Model = HKY+G
   partition = 010010
   -lnL = 215.3766
   K = 37
    freqA = 0.2415
    freqC = 0.2617
    freqG = 0.2942
    freqT = 0.2026
   kappa = 2132.5635 (ti/tv = 1063.7937)
   gamma shape = 62.1850
  Computation time = 00h:00:00:01  (00h:00:03:05)

Maximum likelihod estimation for the HKY+I+G model.
  ML optimized tree topology
   Model = HKY+I+G
   partition = 010010
   -lnL = 215.4267
   K = 38
    freqA = 0.2404
    freqC = 0.2632
    freqG = 0.2928
    freqT = 0.2036
   kappa = 91071.3776 (ti/tv = 45363.6640)
   p-inv = 0.9810
   gamma shape = 0.1380
  Computation time = 00h:00:00:08  (00h:00:04:02)

Maximum likelihod estimation for the SYM model.
  ML optimized tree topology
   Model = SYM
   partition = 012345
   -lnL = 216.1110
   K = 37
   R(a) [AC] =  1.0000
   R(b) [AG] =  3949.0295
   R(c) [AT] =  1.0000
```

```
   R(d) [CG] =  1.0000
   R(e) [CT] =  1.0000
   R(f) [GT] =  1.0000
  Computation time = 00h:00:00:01  (00h:00:04:03)

Maximum likelihod estimation for the SYM+I model.
  ML optimized tree topology
   Model = SYM+I
   partition = 012345
   -lnL = 217.8371
   K = 38
   R(a) [AC] =  1.0002
   R(b) [AG] =  1.0000
   R(c) [AT] =  1.0002
   R(d) [CG] =  1.0000
   R(e) [CT] =  1.0002
   R(f) [GT] =  1.0000
   p-inv = 0.9920
  Computation time = 00h:00:00:01  (00h:00:04:04)

Maximum likelihod estimation for the SYM+G model.
  ML optimized tree topology
   Model = SYM+G
   partition = 012345
   -lnL = 216.1113
   K = 38
   R(a) [AC] =  1.0000
   R(b) [AG] =  3893.2094
   R(c) [AT] =  1.0000
   R(d) [CG] =  1.0000
   R(e) [CT] =  1.0000
   R(f) [GT] =  1.0000
   gamma shape = 62.1850
  Computation time = 00h:00:00:01  (00h:00:04:06)

Maximum likelihod estimation for the SYM+I+G model.
  ML optimized tree topology
   Model = SYM+I+G
   partition = 012345
   -lnL = 216.1062
   K = 39
   R(a) [AC] =  1.0000
   R(b) [AG] =  19432.3529
   R(c) [AT] =  1.0000
   R(d) [CG] =  1.0000
   R(e) [CT] =  1.0000
   R(f) [GT] =  1.0000
   p-inv = 0.8310
   gamma shape = 61.8760
  Computation time = 00h:00:00:05  (00h:00:05:01)

Maximum likelihod estimation for the GTR model.
  ML optimized tree topology
   Model = GTR
   partition = 012345
   -lnL = 214.8083
   K = 40
```

```
    freqA = 0.2402
    freqC = 0.2631
    freqG = 0.2928
    freqT = 0.2039
   R(a) [AC] =  1.0000
   R(b) [AG] =  7108.5994
   R(c) [AT] =  1.0000
   R(d) [CG] =  1.0000
   R(e) [CT] =  1.0000
   R(f) [GT] =  1.0000
  Computation time = 00h:00:00:01  (00h:00:05:02)

Maximum likelihod estimation for the GTR+I model.
  ML optimized tree topology
   Model = GTR+I
   partition = 012345
   -lnL = 216.4729
   K = 41
    freqA = 0.2418
    freqC = 0.2615
    freqG = 0.2942
    freqT = 0.2026
   R(a) [AC] =  1.0002
   R(b) [AG] =  1.0000
   R(c) [AT] =  1.0002
   R(d) [CG] =  1.0000
   R(e) [CT] =  1.0002
   R(f) [GT] =  1.0000
   p-inv = 0.9920
  Computation time = 00h:00:00:01  (00h:00:05:03)

Maximum likelihod estimation for the GTR+G model.
  ML optimized tree topology
   Model = GTR+G
   partition = 012345
   -lnL = 214.8089
   K = 41
    freqA = 0.2402
    freqC = 0.2632
    freqG = 0.2927
    freqT = 0.2039
   R(a) [AC] =  1.0000
   R(b) [AG] =  4399.1639
   R(c) [AT] =  1.0000
   R(d) [CG] =  1.0000
   R(e) [CT] =  1.0000
   R(f) [GT] =  1.0000
   gamma shape = 62.1850
  Computation time = 00h:00:00:02  (00h:00:05:06)

Maximum likelihod estimation for the GTR+I+G model.
  ML optimized tree topology
   Model = GTR+I+G
   partition = 012345
   -lnL = 216.2959
   K = 42
    freqA = 0.2417
```

```
   freqC = 0.2616
   freqG = 0.2940
   freqT = 0.2028
  R(a) [AC] =  1.0697
  R(b) [AG] =  3.8743
  R(c) [AT] =  0.8370
  R(d) [CG] =  1.2843
  R(e) [CT] =  0.7980
  R(f) [GT] =  1.0000
  p-inv = 0.9860
  gamma shape = 0.1880
 Computation time = 00h:00:00:02  (00h:00:05:07)

Computation of likelihood scores completed. It took 00h:00:05:07.



-----------------------------------------------------------------
*                                                               *
*             AKAIKE INFORMATION CRITERION (AIC)                *
*                                                               *
-----------------------------------------------------------------

 Model  selected:
   Model = K80
   partition = 010010
   -lnL = 216.7429
   K = 33
   kappa = 1976.1119 (ti/tv = 988.0560)


* AIC MODEL SELECTION : Selection uncertainty

Model             -lnL    K         AIC      delta      weight cumWeight
-------------------------------------------------------------------------
K80           216.7429   33    499.4858     0.0000      0.2478    0.2478
JC            217.8405   32    499.6810     0.1952      0.2247    0.4725
K80+G         216.7431   34    501.4862     2.0004      0.0911    0.5637
JC+I          217.8371   33    501.6742     2.1884      0.0830    0.6466
JC+G          217.8407   33    501.6814     2.1956      0.0827    0.7293
HKY           215.3764   36    502.7528     3.2670      0.0484    0.7776
F81           216.4763   35    502.9526     3.4668      0.0438    0.8214
K80+I+G       216.7398   35    503.4795     3.9937      0.0336    0.8551
JC+I+G        217.8362   34    503.6725     4.1867      0.0305    0.8856
K80+I         217.8371   34    503.6742     4.1884      0.0305    0.9161
HKY+G         215.3766   37    504.7531     5.2673      0.0178    0.9339
F81+I         216.4729   36    504.9458     5.4600      0.0162    0.9501
F81+G         216.4765   36    504.9530     5.4672      0.0161    0.9662
SYM           216.1110   37    506.2221     6.7363      0.0085    0.9747
HKY+I+G       215.4267   38    506.8534     7.3676      0.0062    0.9809
F81+I+G       216.4719   37    506.9439     7.4581      0.0060    0.9869
HKY+I         216.4729   37    506.9458     7.4600      0.0059    0.9928
SYM+G         216.1113   38    508.2226     8.7368      0.0031    0.9960
GTR           214.8083   40    509.6167    10.1309      0.0016    0.9975
SYM+I+G       216.1062   39    510.2123    10.7265      0.0012    0.9987
GTR+G         214.8089   41    511.6179    12.1321      0.0006    0.9993
SYM+I         217.8371   38    511.6742    12.1884      0.0006    0.9998
```

```
SYM+I         217.8571   38    511.0742    12.1884      0.0000    0.9998
GTR+I         216.4729   41    514.9458    15.4600      0.0001    1.0000
GTR+I+G       216.2959   42    516.5918    17.1060   4.78e-005    1.0000
---------------------------------------------------------------------------
-lnL:       negative log likelihod
 K:         number of estimated parameters
 AIC:       Akaike Information Criterion
 delta:     AIC difference
 weight:    AIC weight
 cumWeight: cumulative AIC weight

Model selection results also available at the "Model > Show model table" menu


* AIC MODEL SELECTION : Confidence interval

There are 24 models in the 100% confidence interval: [ K80 JC K80+G JC+I JC+G HKY F81
K80+I+G JC+I+G K80+I HKY+G F81+I F81+G SYM HKY+I+G F81+I+G HKY+I SYM+G GTR SYM+I+G GTR+G
SYM+I  GTR+I  GTR+I+G ]


* AIC MODEL SELECTION : Parameter importance

Parameter   Importance
----------------------
fA              0.1626
fC              0.1626
fG              0.1626
fT              0.1626
kappa           0.4814
titv            0.4814
rAC             0.0157
rAG             0.0157
rAT             0.0157
rCG             0.0157
rCT             0.0157
rGT             0.0157
pinv(I)         0.1362
alpha(G)        0.2114
pinv(IG)        0.0776
alpha(IG)       0.0776
----------------------
Values have been rounded.
 (I):  considers only +I models.
 (G):  considers only +G models.
 (IG): considers only +I+G models.


* AIC MODEL SELECTION : Model averaged estimates

           Model-averaged
Parameter       estimates
-------------------------
fA                 0,2416
fC                 0,2617
fG                 0,2941
fT                 0,2026
kappa           8704,5988
```

kappa [illegible]
titv 4349,7454
rAC 1,0002
rAG 5234,7092
rAT 0,9995
rCG 1,0009
rCT 0,9994
rGT 1,0000
pinv(I) 0,9920
alpha(G) 62,1850
pinv(IG) 0,9821
alpha(IG) 1,0964

Numbers have been rounded.
(I): considers only +I models.
(G): considers only +G models.
(IG): considers only +I+G models.

---
*
* CORRECTED AKAIKE INFORMATION CRITERION (AICc) *
*

Settings:
Sample size = 152

Model selected:
Model = JC
partition = 000000
-lnL = 217.8405
K = 32

* AICc MODEL SELECTION : Selection uncertainty

Model	-lnL	K	AICc	delta	weight	cumWeight
JC	217.8405	32	517.4289	0.0000	0.4469	0.4469
K80	216.7429	33	518.5027	1.0738	0.2612	0.7082
JC+I	217.8371	33	520.6912	3.2623	0.0875	0.7956
JC+G	217.8407	33	520.6984	3.2695	0.0872	0.8828
K80+G	216.7431	34	521.8281	4.3992	0.0495	0.9323
JC+I+G	217.8362	34	524.0143	6.5854	0.0166	0.9489
K80+I	217.8371	34	524.0161	6.5872	0.0166	0.9655
F81	216.4763	35	524.6767	7.2478	0.0119	0.9775
K80+I+G	216.7398	35	525.2037	7.7748	0.0092	0.9866
HKY	215.3764	36	525.9180	8.4891	0.0064	0.9930
F81+I	216.4729	36	528.1110	10.6821	0.0021	0.9952
F81+G	216.4765	36	528.1182	10.6893	0.0021	0.9973
HKY+G	215.3766	37	529.4198	11.9909	0.0011	0.9984
SYM	216.1110	37	530.8887	13.4598	0.0005	0.9989
F81+I+G	216.4719	37	531.6106	14.1817	0.0004	0.9993
HKY+I	216.4729	37	531.6125	14.1836	0.0004	0.9997
HKY+I+G	215.4267	38	533.0835	15.6546	0.0002	0.9999
SYM+G	216.1113	38	534.4526	17.0237	8.99e-005	1.0000

SYM+I	217.8371	38	537.9043	20.4754	1.60e-005	1.0000
SYM+I+G	216.1062	39	538.0695	20.6406	1.47e-005	1.0000
GTR	214.8083	40	539.1662	21.7374	8.51e-006	1.0000
GTR+G	214.8089	41	542.9270	25.4981	1.30e-006	1.0000
GTR+I	216.4729	41	546.2549	28.8260	2.46e-007	1.0000
GTR+I+G	216.2959	42	549.7294	32.3005	4.33e-008	1.0000

-lnL: negative log likelihod
K: number of estimated parameters
AICc: Corrected Akaike Information Criterion
delta: AICc difference
weight: AICc weight
cumWeight: cumulative AICc weight

Model selection results also available at the "Model > Show model table" menu

* AICc MODEL SELECTION : Confidence interval

There are 24 models in the 100% confidence interval: [JC K80 JC+I JC+G K80+G JC+I+G K80+I F81 K80+I+G HKY F81+I F81+G HKY+G SYM F81+I+G HKY+I HKY+I+G SYM+G SYM+I SYM+I+G GTR GTR+G GTR+I GTR+I+G]

* AICc MODEL SELECTION : Parameter importance

Parameter	Importance
fA	0.0247
fC	0.0247
fG	0.0247
fT	0.0247
kappa	0.3446
titv	0.3446
rAC	0.0007
rAG	0.0007
rAT	0.0007
rCG	0.0007
rCT	0.0007
rGT	0.0007
pinv(I)	0.1066
alpha(G)	0.1400
pinv(IG)	0.0263
alpha(IG)	0.0263

Values have been rounded.
(I): considers only +I models.
(G): considers only +G models.
(IG): considers only +I+G models.

* AICc MODEL SELECTION : Model averaged estimates

Parameter	Model-averaged estimates
fA	0,2417

```
fC                 0,2616
fG                 0,2942
fT                 0,2026
kappa           4102,2564
titv            2050,9873
rAC                1,0000
rAG             4229,2367
rAT                1,0000
rCG                1,0000
rCT                1,0000
rGT                1,0000
pinv(I)            0,9920
alpha(G)          62,1850
pinv(IG)           0,9854
alpha(IG)          0,2167
-------------------------
Numbers have been rounded.
 (I):  considers only +I models.
 (G):  considers only +G models.
 (IG): considers only +I+G models.



---------------------------------------------------------------
*                                                             *
*              BAYESIAN INFORMATION CRITERION (BIC)           *
*                                                             *
---------------------------------------------------------------

Settings:
sample size = 152

 Model  selected:
   Model = JC
   partition = 000000
   -lnL = 217.8405
   K = 32


* BIC MODEL SELECTION : Selection uncertainty

Model              -lnL    K         BIC      delta      weight cumWeight
-------------------------------------------------------------------------
JC             217.8405   32    596.4452     0.0000      0.6929    0.6929
K80            216.7429   33    599.2739     2.8287      0.1684    0.8614
JC+I           217.8371   33    601.4623     5.0171      0.0564    0.9178
JC+G           217.8407   33    601.4695     5.0243      0.0562    0.9740
K80+G          216.7431   34    604.2982     7.8530      0.0137    0.9876
JC+I+G         217.8362   34    606.4844    10.0392      0.0046    0.9922
K80+I          217.8371   34    606.4862    10.0410      0.0046    0.9968
F81            216.4763   35    608.7884    12.3432      0.0014    0.9982
K80+I+G        216.7398   35    609.3154    12.8702      0.0011    0.9993
HKY            215.3764   36    611.6125    15.1673      0.0004    0.9997
F81+I          216.4729   36    613.8055    17.3603      0.0001    0.9998
F81+G          216.4765   36    613.8127    17.3675      0.0001    0.9999
HKY+G          215.3766   37    616.6367    20.1915   2.86e-005    1.0000
SYM            216.1110   37    618.1057    21.6605   1.37e-005    1.0000
```

```
F81+I+G       216.4719   37    618.8275    22.3823   9.56e-006    1.0000
HKY+I         216.4729   37    618.8294    22.3842   9.55e-006    1.0000
HKY+I+G       215.4267   38    621.7609    25.3157   2.21e-006    1.0000
SYM+G         216.1113   38    623.1300    26.6848   1.11e-006    1.0000
SYM+I         217.8371   38    626.5817    30.1365   1.98e-007    1.0000
SYM+I+G       216.1062   39    628.1437    31.6985   9.07e-008    1.0000
GTR           214.8083   40    630.5719    34.1267   2.69e-008    1.0000
GTR+G         214.8089   41    635.5970    39.1518   2.18e-009    1.0000
GTR+I         216.4729   41    638.9249    42.4797   4.13e-010    1.0000
GTR+I+G       216.2959   42    643.5947    47.1496   4.00e-011    1.0000
-------------------------------------------------------------------------
-lnL:       negative log likelihod
K:          number of estimated parameters
BIC:        Bayesian Information Criterion
delta:      BIC difference
weight:     BIC weight
cumWeight:  cumulative BIC weight


Model selection results also available at the "Model > Show model table" menu


* BIC MODEL SELECTION : Confidence interval

There are 24 models in the 100% confidence interval: [ JC K80 JC+I JC+G K80+G JC+I+G K80+I
F81 K80+I+G HKY F81+I F81+G HKY+G SYM F81+I+G HKY+I HKY+I+G SYM+G SYM+I SYM+I+G GTR GTR+G
GTR+I  GTR+I+G ]


* BIC MODEL SELECTION : Parameter importance

Parameter   Importance
----------------------
fA              0.0021
fC              0.0021
fG              0.0021
fT              0.0021
kappa           0.1882
titv            0.1882
rAC             0.0000
rAG             0.0000
rAT             0.0000
rCG             0.0000
rCT             0.0000
rGT             0.0000
pinv(I)         0.0611
alpha(G)        0.0700
pinv(IG)        0.0057
alpha(IG)       0.0057
----------------------
Values have been rounded.
 (I):  considers only +I models.
 (G):  considers only +G models.
 (IG): considers only +I+G models.


* BIC MODEL SELECTION : Model averaged estimates
```

Parameter	Model-averaged estimates
fA	0,2418
fC	0,2615
fG	0,2942
fT	0,2026
kappa	2413,4780
titv	1206,7322
rAC	1,0000
rAG	3991,5768
rAT	1,0000
rCG	1,0000
rCT	1,0000
rGT	1,0000
pinv(I)	0,9920
alpha(G)	62,1850
pinv(IG)	0,9866
alpha(IG)	0,1912

Numbers have been rounded.
 (I): considers only +I models.
 (G): considers only +G models.
 (IG): considers only +I+G models.