```
----------------------------- jModeltest 0.1.1 -----------------------------
(c) 2008 David Posada, Department of Biochemistry, Genetics and Immunology
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----------------------------------------------------------------------------
Wed Oct 19 16:50:27 CEST 2011  (Mac OS X 10.6.8, arch: x86_64)

Reading data file "Glacuoreseda_ITS_ITS2.nex"... OK.
  number of sequences: 17
  number of sites: 212



------------------------------------------------------------------
*                                                                *
*        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 = 495.4615
   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 = 494.4827
   K = 33
   p-inv = 0.5220
  Computation time = 00h:00:00:02  (00h:00:00:04)

Maximum likelihod estimation for the JC+G model.
  ML optimized tree topology
   Model = JC+G
   partition = 000000
   -lnL = 494.5347
   K = 33
   gamma shape = 0.5080
  Computation time = 00h:00:00:04  (00h:00:00:08)

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

```
   -lnL = 507.0050
   K = 34
   p-inv = 0.8200
   gamma shape = 98.6760
  Computation time = 00h:00:00:04  (00h:00:01:02)

Maximum likelihod estimation for the F81 model.
  ML optimized tree topology
   Model = F81
   partition = 000000
   -lnL = 490.8732
   K = 35
    freqA = 0.1740
    freqC = 0.2993
    freqG = 0.2670
    freqT = 0.2598
  Computation time = 00h:00:00:02  (00h:00:01:04)

Maximum likelihod estimation for the F81+I model.
  ML optimized tree topology
   Model = F81+I
   partition = 000000
   -lnL = 489.8228
   K = 36
    freqA = 0.1732
    freqC = 0.2995
    freqG = 0.2665
    freqT = 0.2607
   p-inv = 0.5340
  Computation time = 00h:00:00:04  (00h:00:01:08)

Maximum likelihod estimation for the F81+G model.
  ML optimized tree topology
   Model = F81+G
   partition = 000000
   -lnL = 489.8794
   K = 36
    freqA = 0.1734
    freqC = 0.2995
    freqG = 0.2666
    freqT = 0.2606
   gamma shape = 0.4760
  Computation time = 00h:00:00:05  (00h:00:02:03)

Maximum likelihod estimation for the F81+I+G model.
  ML optimized tree topology
   Model = F81+I+G
   partition = 000000
   -lnL = 501.0364
   K = 37
    freqA = 0.1654
    freqC = 0.3013
    freqG = 0.2648
    freqT = 0.2685
   p-inv = 0.8190
   gamma shape = 98.6400
  Computation time = 00h:00:00:05  (00h:00:02:08)
```

```
Maximum likelihod estimation for the K80 model.
  ML optimized tree topology
   Model = K80
   partition = 010010
   -lnL = 493.4097
   K = 33
   kappa = 2.0257 (ti/tv = 1.0128)
  Computation time = 00h:00:00:01  (00h:00:03:00)

Maximum likelihod estimation for the K80+I model.
  ML optimized tree topology
   Model = K80+I
   partition = 010010
   -lnL = 492.4413
   K = 34
   kappa = 2.0682 (ti/tv = 1.0341)
   p-inv = 0.5160
  Computation time = 00h:00:00:03  (00h:00:03:02)

Maximum likelihod estimation for the K80+G model.
  ML optimized tree topology
   Model = K80+G
   partition = 010010
   -lnL = 492.4938
   K = 34
   kappa = 2.0673 (ti/tv = 1.0337)
   gamma shape = 0.5120
  Computation time = 00h:00:00:04  (00h:00:03:07)

Maximum likelihod estimation for the K80+I+G model.
  ML optimized tree topology
   Model = K80+I+G
   partition = 010010
   -lnL = 505.1961
   K = 35
   kappa = 2.5707 (ti/tv = 1.2853)
   p-inv = 0.8200
   gamma shape = 98.7080
  Computation time = 00h:00:00:04  (00h:00:04:00)

Maximum likelihod estimation for the HKY model.
  ML optimized tree topology
   Model = HKY
   partition = 010010
   -lnL = 488.7558
   K = 36
    freqA = 0.1735
    freqC = 0.2991
    freqG = 0.2693
    freqT = 0.2582
   kappa = 2.0489 (ti/tv = 1.0291)
  Computation time = 00h:00:00:02  (00h:00:04:02)

Maximum likelihod estimation for the HKY+I model.
  ML optimized tree topology
   Model = HKY+I
```

```
   partition = 010010
   -lnL = 487.7989
   K = 37
    freqA = 0.1735
    freqC = 0.2984
    freqG = 0.2696
    freqT = 0.2585
   kappa = 2.0661 (ti/tv = 1.0375)
   p-inv = 0.5140
  Computation time = 00h:00:00:03  (00h:00:04:06)

Maximum likelihod estimation for the HKY+G model.
  ML optimized tree topology
   Model = HKY+G
   partition = 010010
   -lnL = 487.8535
   K = 37
    freqA = 0.1734
    freqC = 0.2985
    freqG = 0.2696
    freqT = 0.2586
   kappa = 2.0663 (ti/tv = 1.0377)
   gamma shape = 0.5180
  Computation time = 00h:00:00:05  (00h:00:05:01)

Maximum likelihod estimation for the HKY+I+G model.
  ML optimized tree topology
   Model = HKY+I+G
   partition = 010010
   -lnL = 499.6778
   K = 38
    freqA = 0.1676
    freqC = 0.2979
    freqG = 0.2693
    freqT = 0.2652
   kappa = 2.2807 (ti/tv = 1.1508)
   p-inv = 0.8190
   gamma shape = 98.3590
  Computation time = 00h:00:00:05  (00h:00:05:06)

Maximum likelihod estimation for the SYM model.
  ML optimized tree topology
   Model = SYM
   partition = 012345
   -lnL = 487.8920
   K = 37
   R(a) [AC] =  0.5844
   R(b) [AG] =  0.5123
   R(c) [AT] =  1.5518
   R(d) [CG] =  0.8797
   R(e) [CT] =  3.2260
   R(f) [GT] =  1.0000
  Computation time = 00h:00:00:02  (00h:00:05:08)

Maximum likelihod estimation for the SYM+I model.
  ML optimized tree topology
   Model = SYM+I
```

```
   partition = 012345
   -lnL = 486.4105
   K = 38
   R(a) [AC] =  0.2705
   R(b) [AG] =  0.2347
   R(c) [AT] =  2.1634
   R(d) [CG] =  1.2096
   R(e) [CT] =  3.4406
   R(f) [GT] =  1.0000
   p-inv = 0.5630
  Computation time = 00h:00:00:03  (00h:00:06:01)

Maximum likelihod estimation for the SYM+G model.
  ML optimized tree topology
   Model = SYM+G
   partition = 012345
   -lnL = 487.0077
   K = 38
   R(a) [AC] =  0.4870
   R(b) [AG] =  0.4836
   R(c) [AT] =  1.6508
   R(d) [CG] =  0.8664
   R(e) [CT] =  3.3884
   R(f) [GT] =  1.0000
   gamma shape = 0.5700
  Computation time = 00h:00:00:05  (00h:00:06:05)

Maximum likelihod estimation for the SYM+I+G model.
  ML optimized tree topology
   Model = SYM+I+G
   partition = 012345
   -lnL = 486.5296
   K = 39
   R(a) [AC] =  0.0006
   R(b) [AG] =  0.2300
   R(c) [AT] =  2.4063
   R(d) [CG] =  1.1281
   R(e) [CT] =  3.6618
   R(f) [GT] =  1.0000
   p-inv = 0.3740
   gamma shape = 0.8230
  Computation time = 00h:00:00:06  (00h:00:07:02)

Maximum likelihod estimation for the GTR model.
  ML optimized tree topology
   Model = GTR
   partition = 012345
   -lnL = 484.1482
   K = 40
    freqA = 0.1811
    freqC = 0.2936
    freqG = 0.2827
    freqT = 0.2426
   R(a) [AC] =  0.6881
   R(b) [AG] =  0.6137
   R(c) [AT] =  1.9517
   R(d) [CG] =  0.7927
```

```
   R(e) [CT] =  3.1721
   R(f) [GT] =  1.0000
  Computation time = 00h:00:00:02  (00h:00:07:03)

Maximum likelihod estimation for the GTR+I model.
  ML optimized tree topology
   Model = GTR+I
   partition = 012345
   -lnL = 482.9470
   K = 41
    freqA = 0.1842
    freqC = 0.2911
    freqG = 0.2850
    freqT = 0.2398
   R(a) [AC] =  0.3143
   R(b) [AG] =  0.2798
   R(c) [AT] =  2.7987
   R(d) [CG] =  1.0746
   R(e) [CT] =  3.3879
   R(f) [GT] =  1.0000
   p-inv = 0.5690
  Computation time = 00h:00:00:04  (00h:00:07:07)

Maximum likelihod estimation for the GTR+G model.
  ML optimized tree topology
   Model = GTR+G
   partition = 012345
   -lnL = 483.2485
   K = 41
    freqA = 0.1808
    freqC = 0.2938
    freqG = 0.2831
    freqT = 0.2424
   R(a) [AC] =  0.5753
   R(b) [AG] =  0.5834
   R(c) [AT] =  2.1156
   R(d) [CG] =  0.7657
   R(e) [CT] =  3.3106
   R(f) [GT] =  1.0000
   gamma shape = 0.5580
  Computation time = 00h:00:00:06  (00h:00:08:03)

Maximum likelihod estimation for the GTR+I+G model.
  ML optimized tree topology
   Model = GTR+I+G
   partition = 012345
   -lnL = 483.0438
   K = 42
    freqA = 0.1844
    freqC = 0.2917
    freqG = 0.2852
    freqT = 0.2387
   R(a) [AC] =  0.0010
   R(b) [AG] =  0.2728
   R(c) [AT] =  3.1048
   R(d) [CG] =  0.9882
   R(e) [CT] =  3.5975
   R(f) [GT] =  1.0000
```

```
   R(f) [GT] =  1.0000
   p-inv = 0.3470
   gamma shape = 0.7110
  Computation time = 00h:00:00:09  (00h:00:09:02)

Computation of likelihood scores completed. It took 00h:00:09:02.




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

 Model  selected:
   Model = GTR+I
   partition = 012345
   -lnL = 482.9470
   K = 41
    freqA = 0.1842
    freqC = 0.2911
    freqG = 0.2850
    freqT = 0.2398
   R(a) [AC] =  0.3143
   R(b) [AG] =  0.2798
   R(c) [AT] =  2.7987
   R(d) [CG] =  1.0746
   R(e) [CT] =  3.3879
   R(f) [GT] =  1.0000
   p-inv = 0.5690


* AIC MODEL SELECTION : Selection uncertainty

Model             -lnL    K         AIC      delta      weight cumWeight
-------------------------------------------------------------------------
GTR+I         482.9470   41   1047.8940     0.0000      0.1535    0.1535
GTR           484.1482   40   1048.2965     0.4025      0.1255    0.2791
GTR+G         483.2485   41   1048.4971     0.6031      0.1136    0.3927
SYM+I         486.4105   38   1048.8209     0.9269      0.0966    0.4892
HKY           488.7558   36   1049.5117     1.6176      0.0684    0.5576
HKY+I         487.7989   37   1049.5978     1.7038      0.0655    0.6231
HKY+G         487.8535   37   1049.7070     1.8130      0.0620    0.6851
SYM           487.8920   37   1049.7840     1.8900      0.0597    0.7448
SYM+G         487.0077   38   1050.0154     2.1213      0.0532    0.7980
GTR+I+G       483.0438   42   1050.0875     2.1935      0.0513    0.8493
SYM+I+G       486.5296   39   1051.0592     3.1652      0.0315    0.8808
F81+I         489.8228   36   1051.6457     3.7517      0.0235    0.9043
F81           490.8732   35   1051.7465     3.8525      0.0224    0.9267
F81+G         489.8794   36   1051.7588     3.8648      0.0222    0.9489
K80           493.4097   33   1052.8195     4.9255      0.0131    0.9620
K80+I         492.4413   34   1052.8825     4.9885      0.0127    0.9747
K80+G         492.4938   34   1052.9876     5.0936      0.0120    0.9867
JC            495.4615   32   1054.9231     7.0290      0.0046    0.9913
JC+I          494.4827   33   1054.9654     7.0713      0.0045    0.9958
JC+G          494.5347   33   1055.0694     7.1754      0.0042    1.0000
```

```
JC+G          494.3547   33   1055.0694     7.1754      0.0042    1.0000
HKY+I+G       499.6778   38   1075.3555    27.4615   1.67e-007    1.0000
F81+I+G       501.0364   37   1076.0728    28.1788   1.17e-007    1.0000
K80+I+G       505.1961   35   1080.3921    32.4981   1.35e-008    1.0000
JC+I+G        507.0050   34   1082.0101    34.1160   6.00e-009    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: [ GTR+I GTR GTR+G SYM+I HKY HKY+I HKY+G
SYM SYM+G GTR+I+G SYM+I+G F81+I F81 F81+G K80 K80+I K80+G JC JC+I JC+G HKY+I+G F81+I+G
K80+I+G  JC+I+G ]


* AIC MODEL SELECTION : Parameter importance

Parameter   Importance
----------------------
fA              0.7080
fC              0.7080
fG              0.7080
fT              0.7080
kappa           0.8039
titv            0.2337
rAC             0.6849
rAG             0.6849
rAT             0.6849
rCG             0.6849
rCT             0.6849
rGT             0.6849
pinv(I)         0.3563
alpha(G)        0.2673
pinv(IG)        0.0828
alpha(IG)       0.0828
----------------------
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                 0,1791
fC                 0,2949
fG                 0,2782
```

```
fC                0,2482
fT                0,2478
kappa             0,5986
titv              1,0333
rAC               0,4190
rAG               0,4183
rAT               2,2477
rCG               0,9536
rCT               3,3572
rGT               1,0000
pinv(I)           0,5525
alpha(G)          0,5414
pinv(IG)          0,3573
alpha(IG)         0,7540
-------------------------
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 = 212

 Model  selected:
   Model = HKY
   partition = 010010
   -lnL = 488.7558
   K = 36
    freqA = 0.1735
    freqC = 0.2991
    freqG = 0.2693
    freqT = 0.2582
   kappa = 2.0489 (ti/tv = 1.0291)


* AICc MODEL SELECTION : Selection uncertainty

Model             -lnL    K         AICc     delta      weight cumWeight
-------------------------------------------------------------------------
HKY           488.7558   36   1064.7345     0.0000      0.1270    0.1270
K80           493.4097   33   1065.4262     0.6917      0.0898    0.2168
HKY+I         487.7989   37   1065.7587     1.0242      0.0761    0.2929
HKY+G         487.8535   37   1065.8679     1.1334      0.0720    0.3649
SYM           487.8920   37   1065.9449     1.2104      0.0693    0.4342
SYM+I         486.4105   38   1065.9538     1.2193      0.0690    0.5032
F81           490.8732   35   1066.0647     1.3301      0.0653    0.5685
K80+I         492.4413   34   1066.3288     1.5943      0.0572    0.6257
K80+G         492.4938   34   1066.4339     1.6994      0.0543    0.6800
JC            495.4615   32   1066.7219     1.9874      0.0470    0.7270
F81+I         489.8228   36   1066.8685     2.1340      0.0437    0.7707
```

```
F81+G         489.8794   36   1066.9816     2.2471      0.0413    0.8119
SYM+G         487.0077   38   1067.1483     2.4138      0.0380    0.8499
GTR           484.1482   40   1067.4778     2.7432      0.0322    0.8821
JC+I          494.4827   33   1067.5721     2.8376      0.0307    0.9128
JC+G          494.5347   33   1067.6762     2.9416      0.0292    0.9420
GTR+I         482.9470   41   1068.1528     3.4183      0.0230    0.9650
GTR+G         483.2485   41   1068.7559     4.0214      0.0170    0.9820
SYM+I+G       486.5296   39   1069.1987     4.4642      0.0136    0.9956
GTR+I+G       483.0438   42   1071.4603     6.7258      0.0044    1.0000
F81+I+G       501.0364   37   1092.2337    27.4992   1.36e-007    1.0000
HKY+I+G       499.6778   38   1092.4884    27.7539   1.19e-007    1.0000
K80+I+G       505.1961   35   1094.7103    29.9758   3.93e-008    1.0000
JC+I+G        507.0050   34   1095.4564    30.7219   2.71e-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: [ HKY K80 HKY+I HKY+G SYM SYM+I F81
K80+I K80+G JC F81+I F81+G SYM+G GTR JC+I JC+G GTR+I GTR+G SYM+I+G GTR+I+G F81+I+G HKY+I+G
K80+I+G  JC+I+G  ]


* AICc MODEL SELECTION : Parameter importance

Parameter   Importance
----------------------
fA              0.5019
fC              0.5019
fG              0.5019
fT              0.5019
kappa           1.0899
titv            0.4764
rAC             0.2665
rAG             0.2665
rAT             0.2665
rCG             0.2665
rCT             0.2665
rGT             0.2665
pinv(I)         0.2997
alpha(G)        0.2517
pinv(IG)        0.0180
alpha(IG)       0.0180
----------------------
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	0,1748
fC	0,2980
fG	0,2708
fT	0,2564
kappa	0,8979
titv	1,0298
rAC	0,4384
rAG	0,4147
rAT	1,9854
rCG	0,9767
rCT	3,3460
rGT	1,0000
pinv(I)	0,5336
alpha(G)	0,5192
pinv(IG)	0,3674
alpha(IG)	0,7974

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

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*

* BAYESIAN INFORMATION CRITERION (BIC) *

*

Settings:
sample size = 212

 Model selected:
   Model = JC
   partition = 000000
   -lnL = 495.4615
   K = 32

* BIC MODEL SELECTION : Selection uncertainty

Model	-lnL	K	BIC	delta	weight	cumWeight
JC	495.4615	32	1162.3338	0.0000	0.4646	0.4646
K80	493.4097	33	1163.5868	1.2530	0.2483	0.7130
JC+I	494.4827	33	1165.7327	3.3989	0.0849	0.7979
JC+G	494.5347	33	1165.8368	3.5029	0.0806	0.8785
K80+I	492.4413	34	1167.0065	4.6726	0.0449	0.9235
K80+G	492.4938	34	1167.1116	4.7777	0.0426	0.9661
F81	490.8732	35	1169.2270	6.8932	0.0148	0.9809

HKY	488.7558	36	1170.3488	8.0149	0.0084	0.9893
F81+I	489.8228	36	1172.4828	10.1490	0.0029	0.9922
F81+G	489.8794	36	1172.5959	10.2621	0.0027	0.9950
HKY+I	487.7989	37	1173.7915	11.4577	0.0015	0.9965
HKY+G	487.8535	37	1173.9007	11.5669	0.0014	0.9979
SYM	487.8920	37	1173.9777	11.6439	0.0014	0.9993
SYM+I	486.4105	38	1176.3712	14.0374	0.0004	0.9997
SYM+G	487.0077	38	1177.5656	15.2318	0.0002	0.9999
SYM+I+G	486.5296	39	1181.9661	19.6322	2.54e-005	1.0000
GTR	484.1482	40	1182.5599	20.2261	1.88e-005	1.0000
GTR+I	482.9470	41	1185.5141	23.1802	4.30e-006	1.0000
GTR+G	483.2485	41	1186.1171	23.7833	3.18e-006	1.0000
GTR+I+G	483.0438	42	1191.0641	28.7303	2.68e-007	1.0000
JC+I+G	507.0050	34	1196.1340	33.8002	2.13e-008	1.0000
K80+I+G	505.1961	35	1197.8726	35.5388	8.91e-009	1.0000
F81+I+G	501.0364	37	1200.2665	37.9327	2.69e-009	1.0000
HKY+I+G	499.6778	38	1202.9058	40.5720	7.20e-010	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+I K80+G F81 HKY F81+I F81+G HKY+I HKY+G SYM SYM+I SYM+G SYM+I+G GTR GTR+I GTR+G GTR+I+G JC+I+G K80+I+G F81+I+G HKY+I+G]

* BIC MODEL SELECTION : Parameter importance

Parameter	Importance
fA	0.0319
fC	0.0319
fG	0.0319
fT	0.0319
kappa	1.5282
titv	0.3473
rAC	0.0021
rAG	0.0021
rAT	0.0021
rCG	0.0021
rCT	0.0021
rGT	0.0021
pinv(I)	0.1347
alpha(G)	0.1277
pinv(IG)	0.0000
alpha(IG)	0.0000

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	0,1737
fC	0,2992
fG	0,2678
fT	0,2594
kappa	0,4629
titv	1,0188
rAC	0,5038
rAG	0,4505
rAT	1,7032
rCG	0,9469
rCT	3,2924
rGT	1,0000
pinv(I)	0,5203
alpha(G)	0,5089
pinv(IG)	0,3743
alpha(IG)	0,9499

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