

Report on Task 2 and further work

A. Moya

- Introduction (Codes involved and procedure)
 - Frequency comparison
 - Large separation comparison
 - Small separation comparison
 - Conclusions and further work



INTRODUCTION

Equilibrium model

M/M_{\odot}	$\log T_{\text{eff}}$	$\log g$	$\log L/L_{\odot}$	R/R_{\odot}	X_{C}	Age (My)	Mesh points
1.2	3.800	4.399	0.250	1.146	0.69	96.7	902



MODCONV



	ADIPLS	POSC	NOC	GraCo	FILOU	LOC	OSCROX
PI	J. Christensen-Dalsgaard	M. Monteiro	J. Provost	A. Moya	J.C. Suárez	R. Scufaire	I. Roxburgh

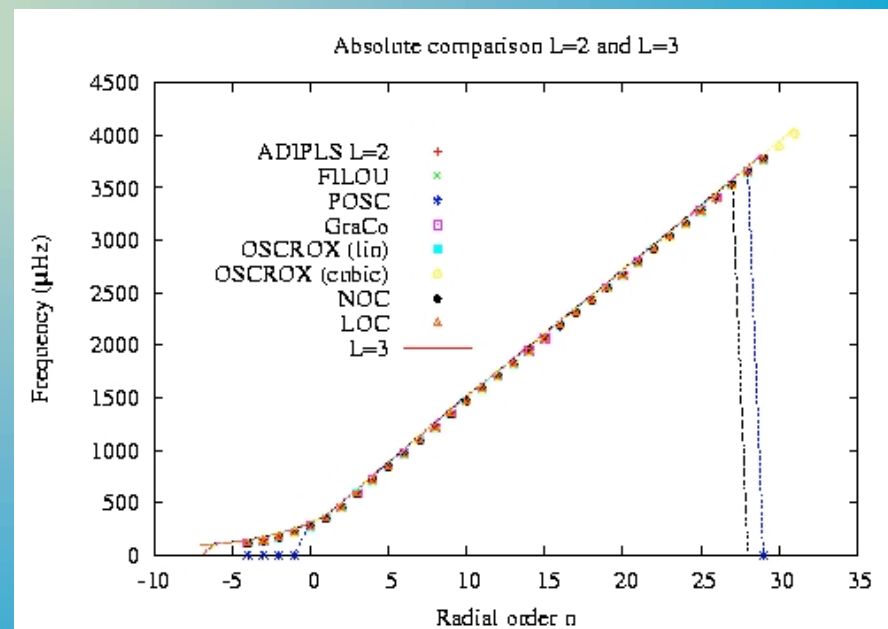
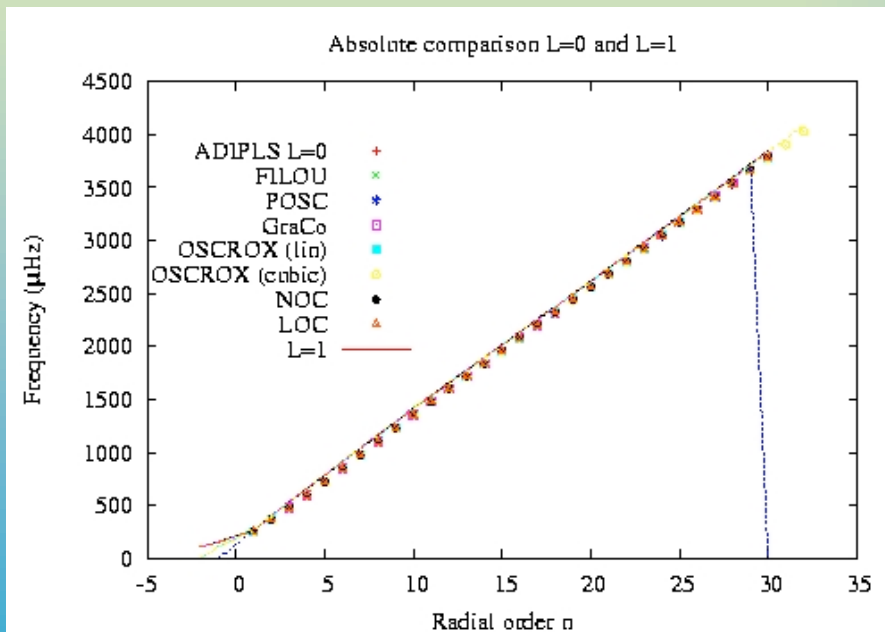


Frequency comparison

Absolute values

$\ell = 0$ and 1

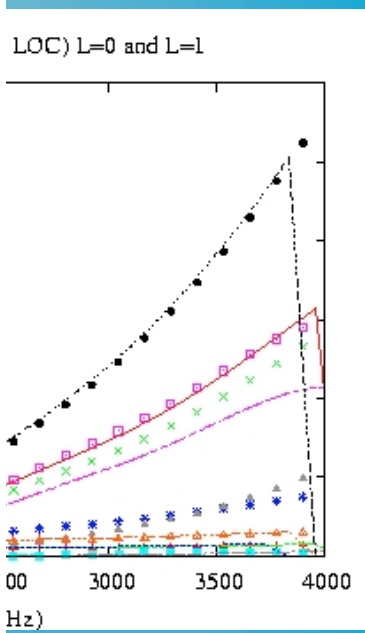
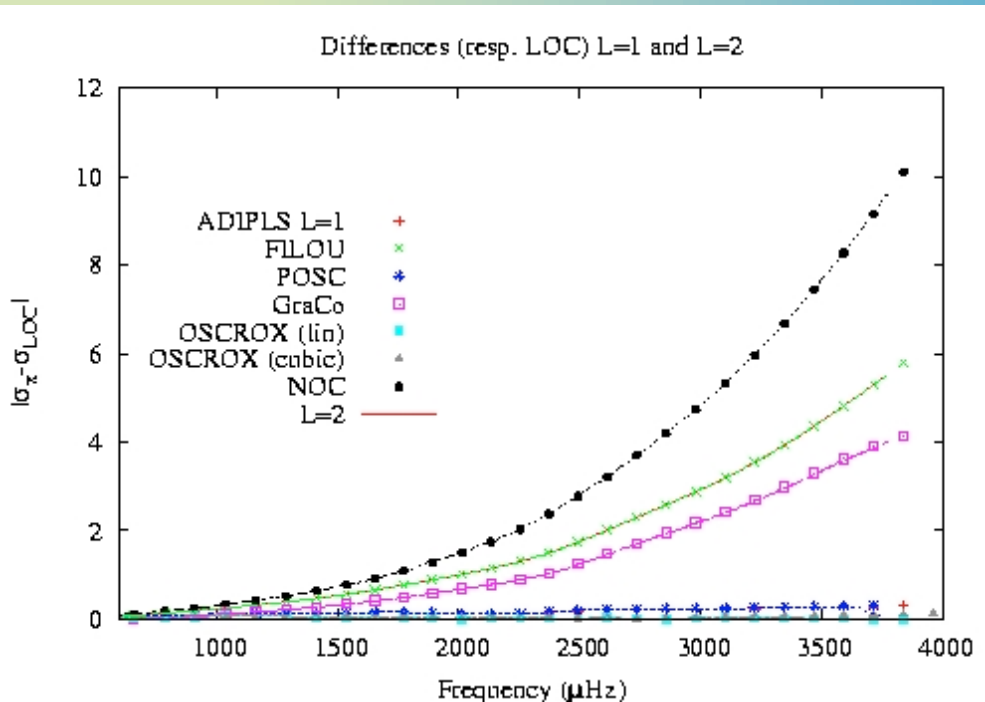
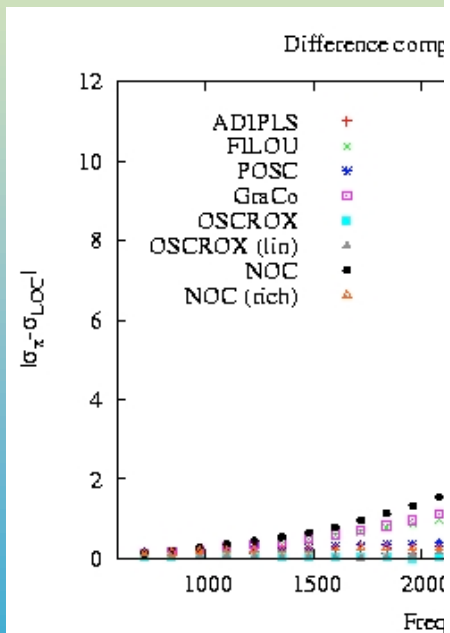
$\ell = 2$ and 3



Frequency comparison

Absolute differences

$\ell = 0$ $\ell = 1$ and 2 $\ell = 0$ and 1



Frequency comparison

Summary of differences resp. LOC

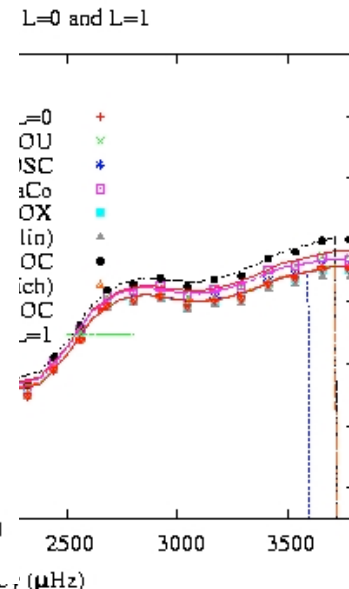
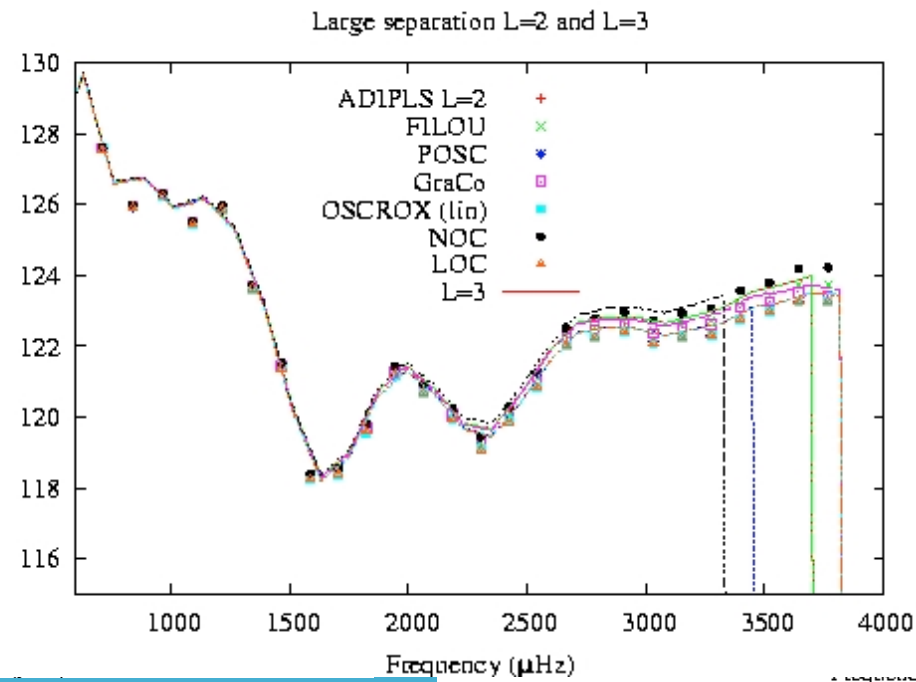
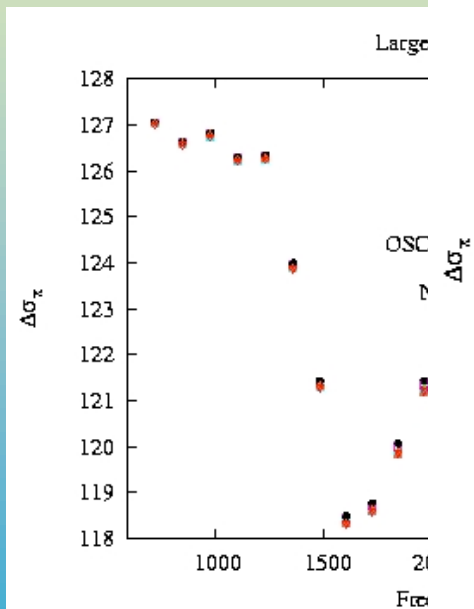
	$\ell=0$		$\ell=1$	
	Absolute difference	% difference	Absolute difference	% difference
ADIPLS	0.12	0.011	0.12	0.012
POSC	1.5	0.039	0.12	0.012
NOC (no Richard.)	10.5	0.268	10.11	0.26
GraCo	5.81	0.149	4.28	0.11
FILOU	5.33	0.136	6.28	0.159
OSCROX	1.96	0.05	0.14	0.003



Large separation comparison

Absolute values

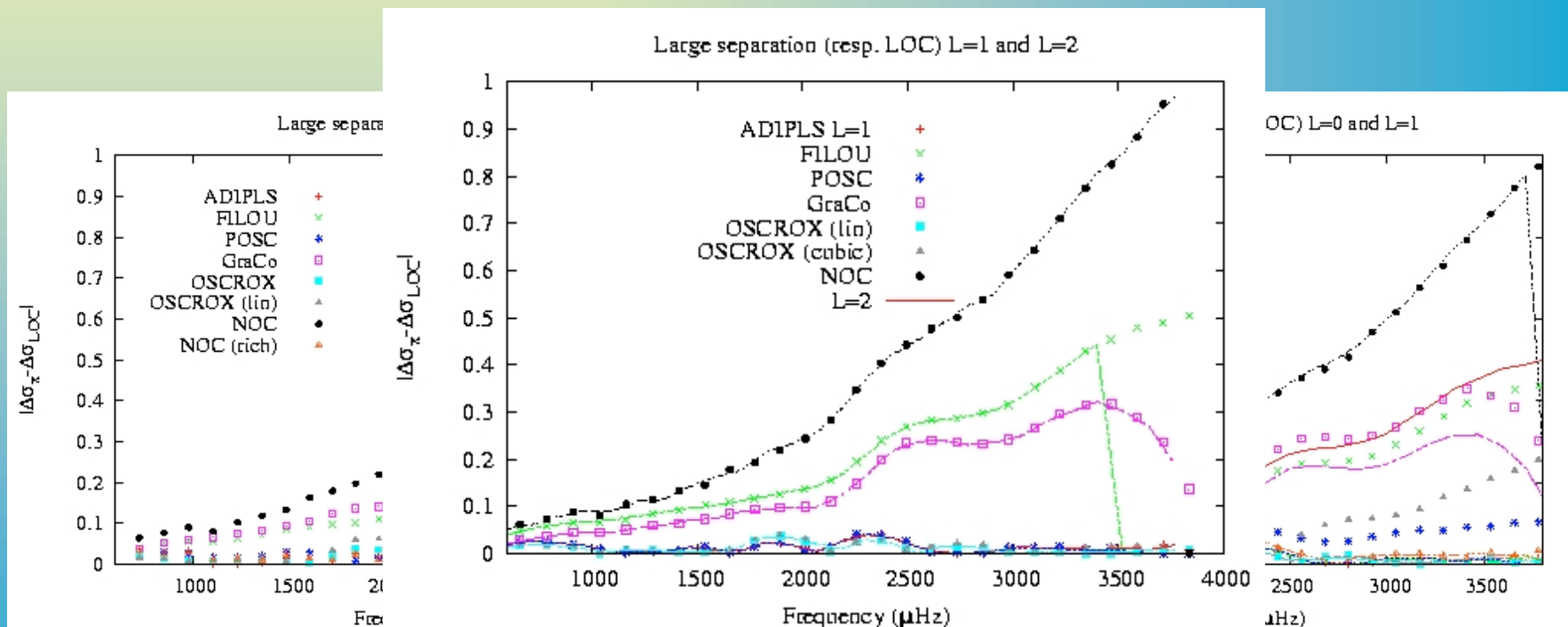
$\ell = 0$ $\ell = 2$ and 3 $\ell = 0$ and 1



Large separation comparison

Absolute differences

$\ell = 0$ $\ell = 1$ and 2 $\ell = 0$ and 1



Large separation comparison

Summary of differences resp. LOC

	$\ell=0$		$\ell=1$	
	Absolute difference	% difference	Absolute difference	% difference
ADIPLS	0.038	0.032	0.037	0.031
POSC	0.103	0.083	0.041	0.034
NOC (no Richard.)	0.972	0.79	0.952	0.77
GraCo	0.411	0.335	0.316	0.258
FILOU	0.354	0.354	0.396	0.396
OSCROX	0.255	0.207	0.037	0.031

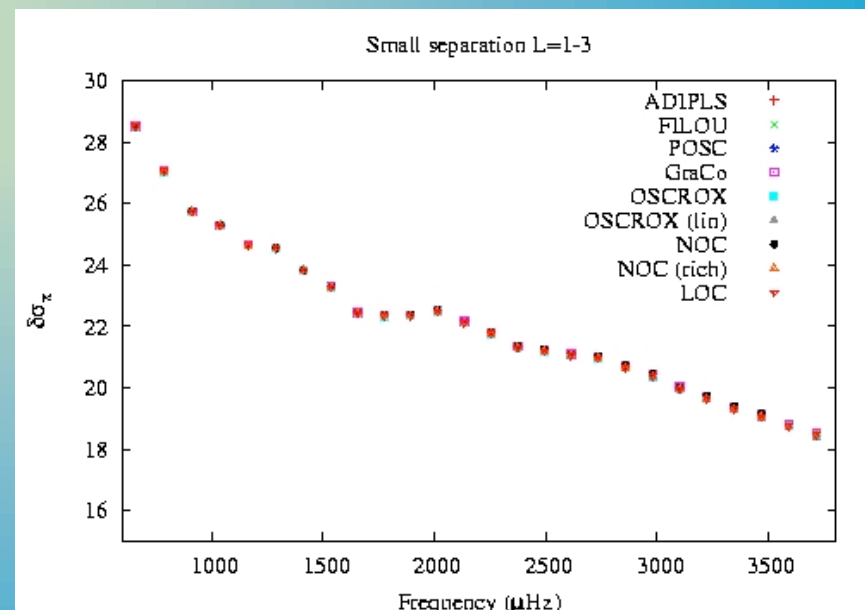
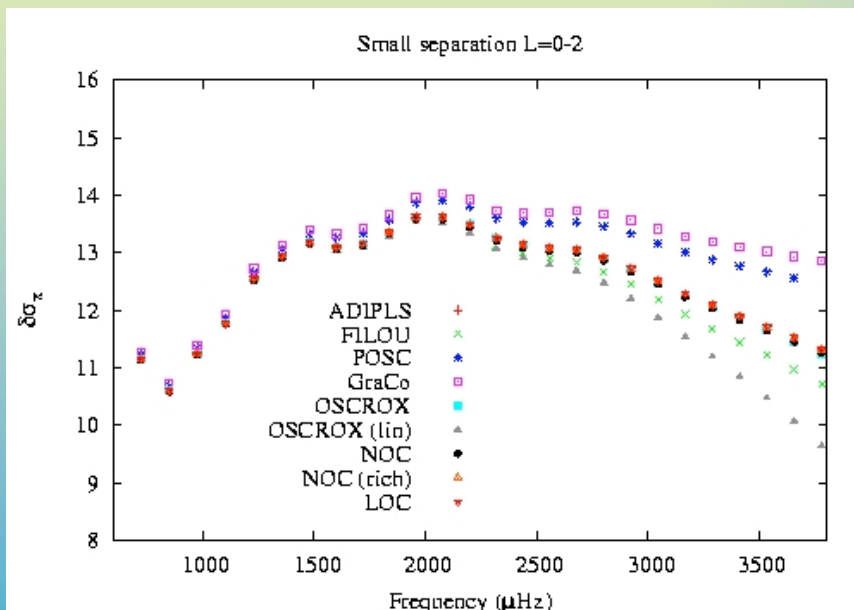


Small separation comparison

Absolute values

$\ell = 0-2$

$\ell = 1-3$

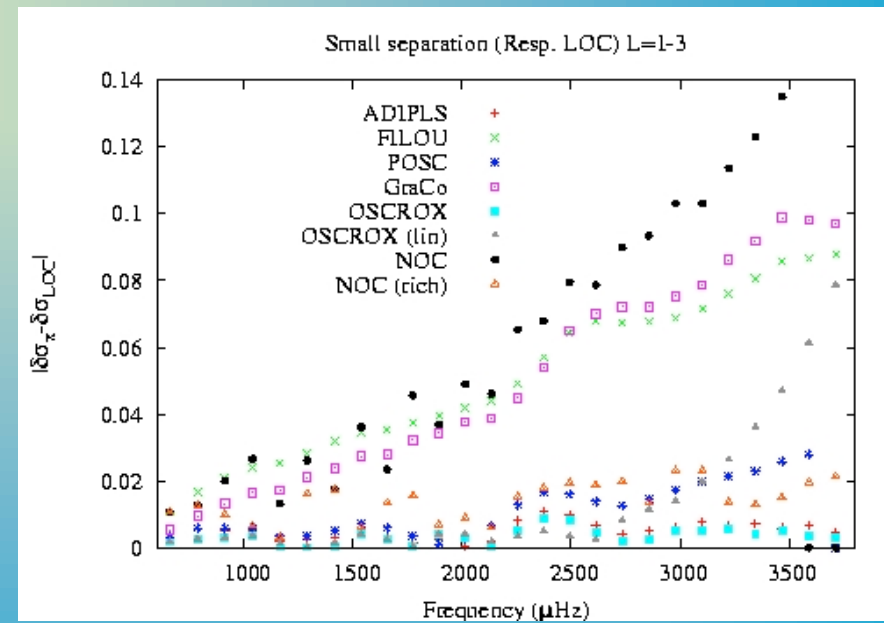
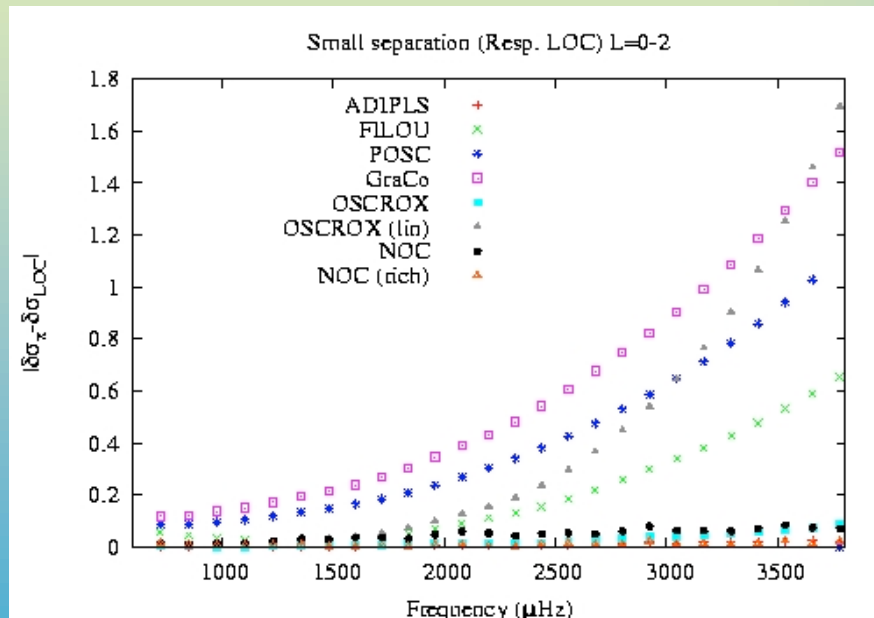


Small separation comparison

Absolute differences

$\ell = 0-2$

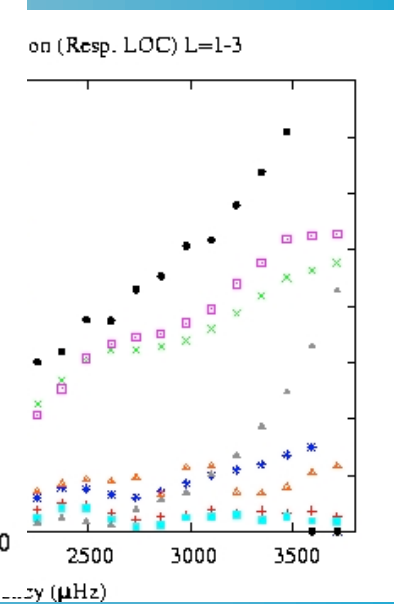
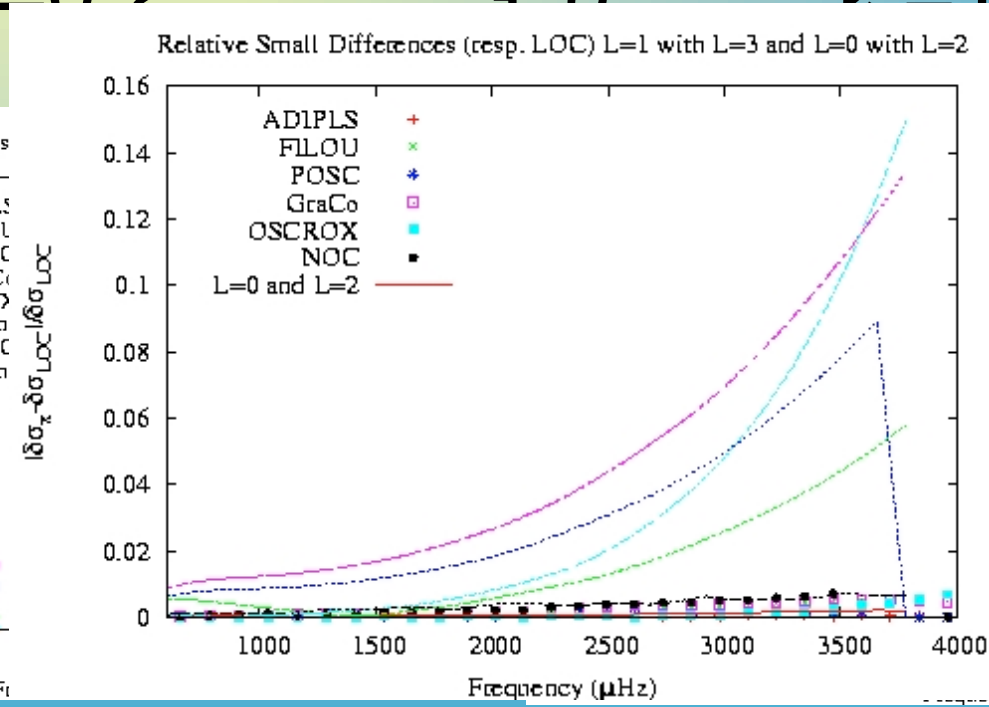
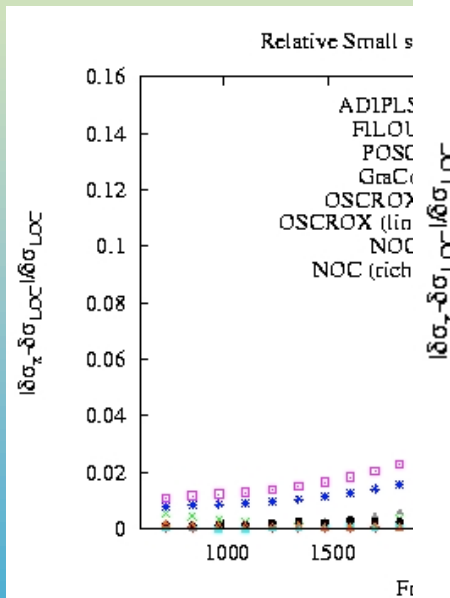
$\ell = 1-3$



Small separation comparison

Relative differences

$\ell = 0-2$ $\ell = 0-2$ and $\ell = 1-3$ $\ell = 1-3$



Small separation comparison

Summary of differences resp. LOC

	$\ell=0$		$\ell=1$	
	Absolute difference	% difference	Absolute difference	% difference
ADIPLS	0.023	0.23	0.0079	0.039
POSC	1.027	8.91	0.028	0.149
NOC (no Richard.)	0.083	0.712	0.135	0.709
GraCo	1.519	13.4	0.0972	0.527
FILOU	0.653	5.77	0.088	0.485
OSCROX	1.69	14.95	0.099	0.545



Conclusions and further work

	Frequency comparison		Large separation		Small separation	
	$\ell=0$	$\ell=1$	$\ell=0$	$\ell=1$	$\ell=0-2$	$\ell=1-3$
Absolute diff.	10	10	1	1	1.5	0.14
% diff.	0.25	0.25	0.8	0.8	16	0.7



Conclusions and further work

1. Richardson extrapolation not used by all codes
2. We must use the same value of the gravity constant G
3. Is there any number of mesh points minimizing the differences? (maybe around 2000)
4. We must use the same boundary condition $\delta P(R)=0$
5. More information and contributions in:
<http://www.astro.up.pt/corot/compfreqs/task2.html>



Example about Richardson extrapolation:

	LOC	Graco no RI	GraCo with RI
Frequency $l=0, n=23$	2922.45	2925.30	2921.25

$$H_0(\text{FILOU})=2924.87 \mu\text{Hz}$$

$$H_0(\text{NOC})=2926.8 \mu\text{Hz}$$

$$H_0(\text{ADIPLS})=2922.6471 \mu\text{Hz}$$

$$H_0(\text{POSC})=2923.2584 \mu\text{Hz}$$



Example about constant G:

	Graco $G=6.673 \cdot 10^{-8}$	Graco $G=6.67232 \cdot 10^{-8}$	GraCo $G=6.671682 \cdot 10^{-8}$
Frequency H0	254.0617 μHz	254.0482 μHz	254.0356 μHz

$$H0(\text{LOC})=254.0304 \mu\text{Hz}$$

$$H0(\text{NOC})=254.05 \mu\text{Hz}$$

$$H0(\text{ADIPLS})=254.0438 \mu\text{Hz}$$

$$H0(\text{POSC})=254.051 \mu\text{Hz}$$



Groups with similar behaviors

Frequencies	LOC-ADIPLS- OSCROX (linear)	POSC- OSCROX (cubic)	FILOU-GraCo
Large separation L=0	LOC-ADIPLS- OSCROX (linear)	POSC- OSCROX (cubic)	FILOU-GraCo
Large separation L=1	LOC-ADIPLS- OSCROX (lin)- POSC- OSCROX (cubic)	FILOU-GraCo	
Small separation L=0-2	LOC-ADIPLS- OSCROX (lin)- NOC	GraCo-POSC- OSCROX (cubic)	
Small separation L=1-3	LOC-ADIPLS- OSCROX (lin)- POSC	GraCo-FILOU- NOC	



We need a better knowledge
about how we treat boundaries
and the constants used.

Optimize number and distribution
of mesh points.

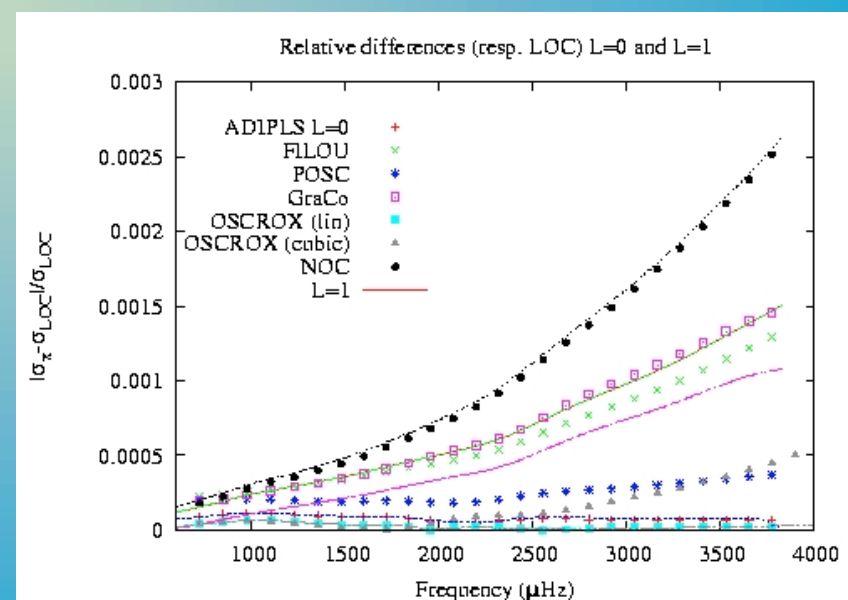
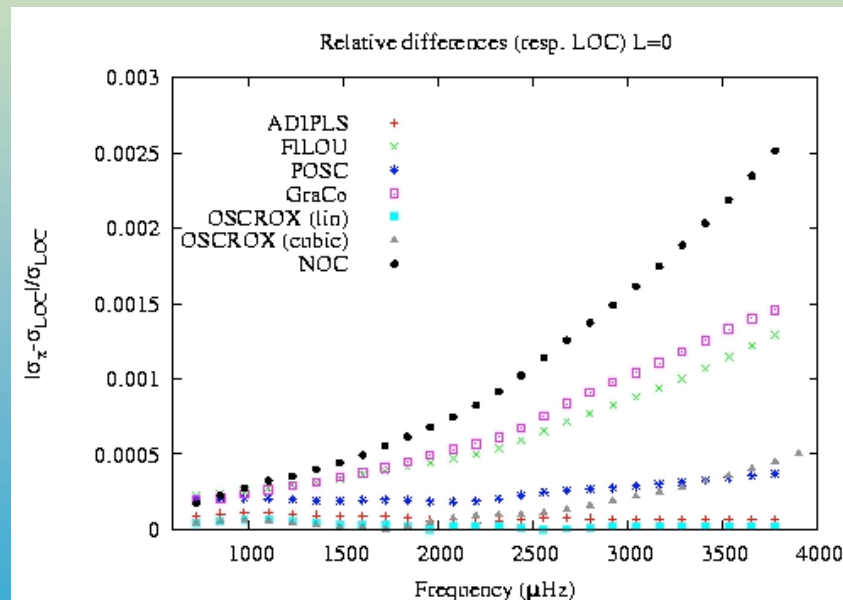


Frequency comparison

Relative differences

$l = 0$

$l = 0$ and 1



Large separation comparison

Relative differences

