

Cosmology with an ELT

Reminders

ELTs will work with AO systems

reduced field of view

point sources favoured over extended objects

both go against current themes in cosmology

statistical cosmology

galaxy sizes are around 0.2''

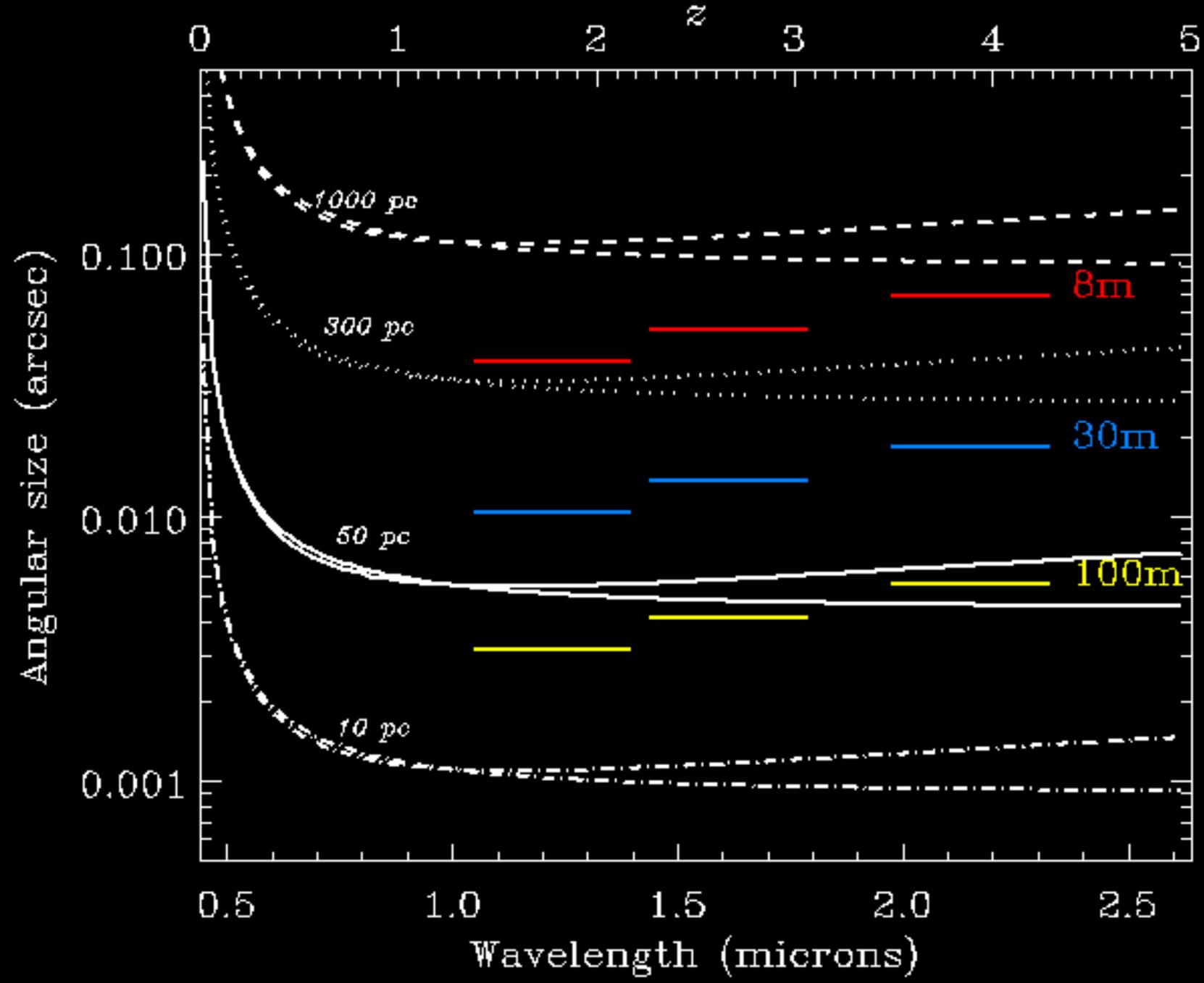
The Leiden Dilemma

Would like to have large fields (up to 10')

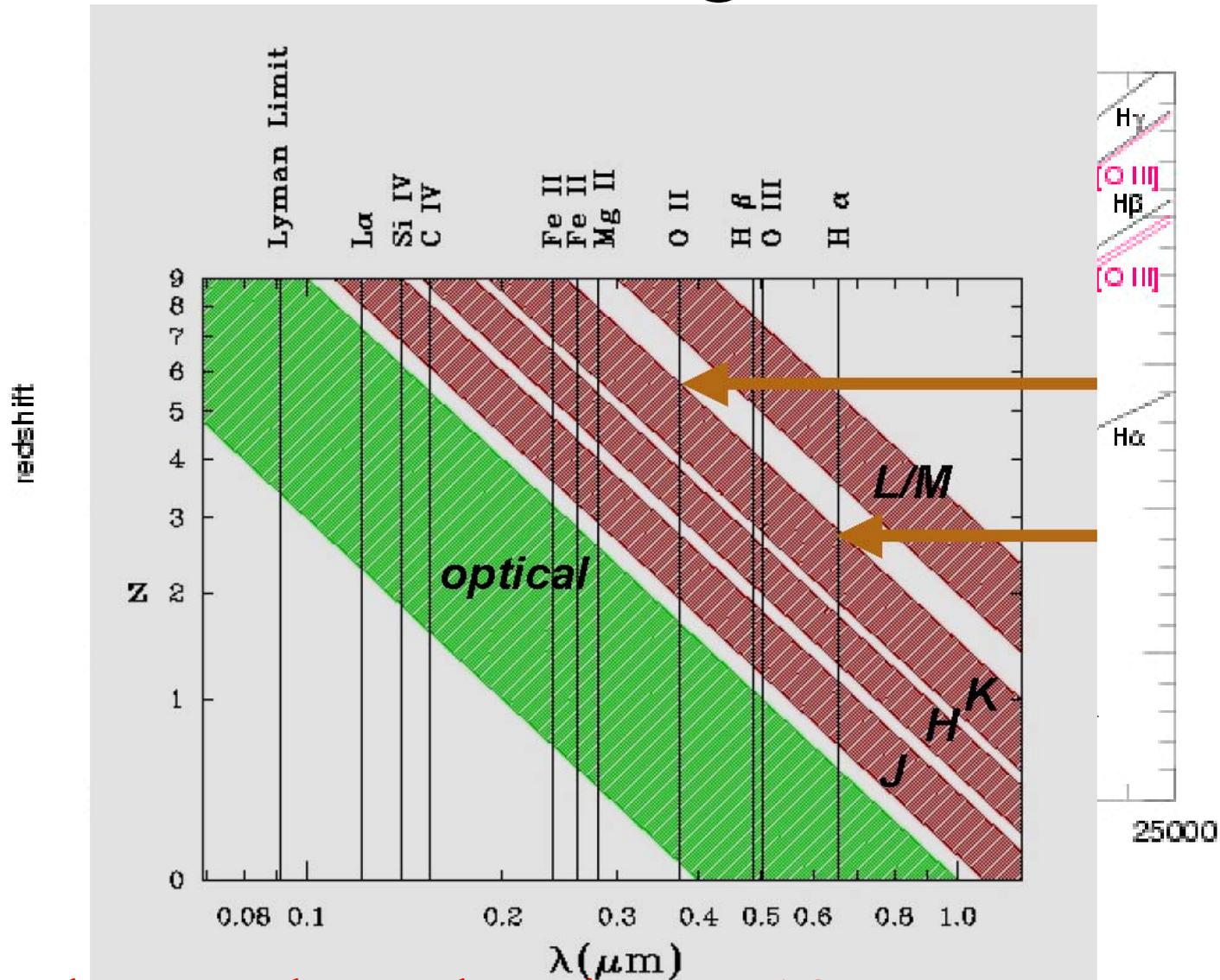
Sampling around 0.1" (to match galaxy size)

“Classical cosmology” is not possible with an
ELT

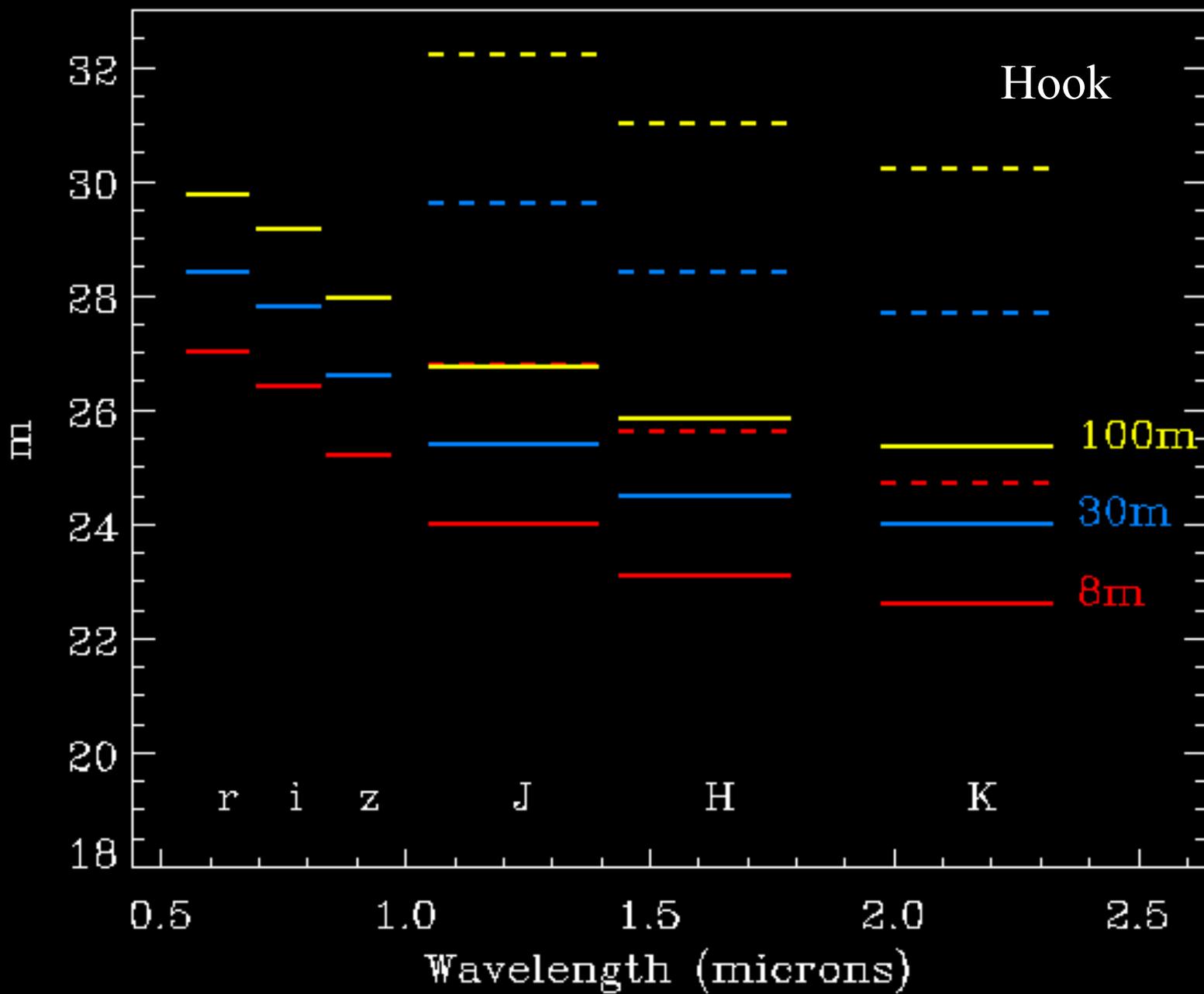
see, however, plans to map 3D structure in the
TMT case



Redshift is good ...



Ly- α leaves the K-band at $z=19$



A deep field astronomical image showing a vast field of galaxies in various colors and shapes against a dark background. The galaxies are scattered across the frame, with some appearing as bright, distinct points of light and others as faint, elongated structures. The colors range from bright yellow and orange to deep blue and purple. The overall appearance is that of a rich, multi-colored galaxy population.

GOODS CDF-S

Recurrent themes

Several topics have featured in all meetings of the SWG so far (and others!)

Cosmological parameters

dark matter, dark energy, expansion history

First light

observe end of reionisation era, identify sources responsible for ionising the universe

Cosmic Web

observe the build-up of the large scale structure, observe the clumping of the gas

Evolution of galaxies

determine the star formation rate as function of age of the universe

Black hole and galaxy connection

build up of super-massive black holes

Other themes

Mass assembly

kinematics of galaxies out to $z > 3$

Chemical enrichment

Fundamental physics

Changing fundamental constants?

α , G , c , h

Theory of gravity

Particle masses

Exotic matter

Summary of Berlin meeting

Fundamental physics and Cosmology

dark energy \rightarrow characterise $\rho(z)$, $w(z)$

dark matter \rightarrow supersymmetry, sterile neutrino

cosmological defects

variation of physical constants

statistical properties of fluctuations \rightarrow non-Gaussianity

Topology of universe \rightarrow ghost images

Big bang \rightarrow flatness, homogeneity, monopoles, fluctuations

Baryogenesis, leptogenesis, matter-antimatter asymmetry

Theory of gravity, tests of GR in weak fields

Tests of gravity in strong fields

equation of state at ultra-high densities

Summary of Berlin meeting

High-redshift universe, galaxies and galaxy evolution

When (and where) do stars form and galaxies assemble?

Co-evolution of galaxies and their central black holes

Evolution of large-scale structure as traced by gas and galaxies ('cosmic web')

Summary of Berlin meeting

AGN and Compact Objects

Probe strong-field gravity near the black hole event horizon

Resolve the formation and collimation of jets

Imaging, kinematics and dynamics of:

 broad-line region

 obscuring torus

Understand the relation between accretion and jet formation

Magnetic fields

Environmental impact

Feedback in cooling cores

AGN and starbursts

SMBH and galaxy formation

Census of AGN

BH and galaxy evolution

Some cosmology cases

GRBs to very high redshifts

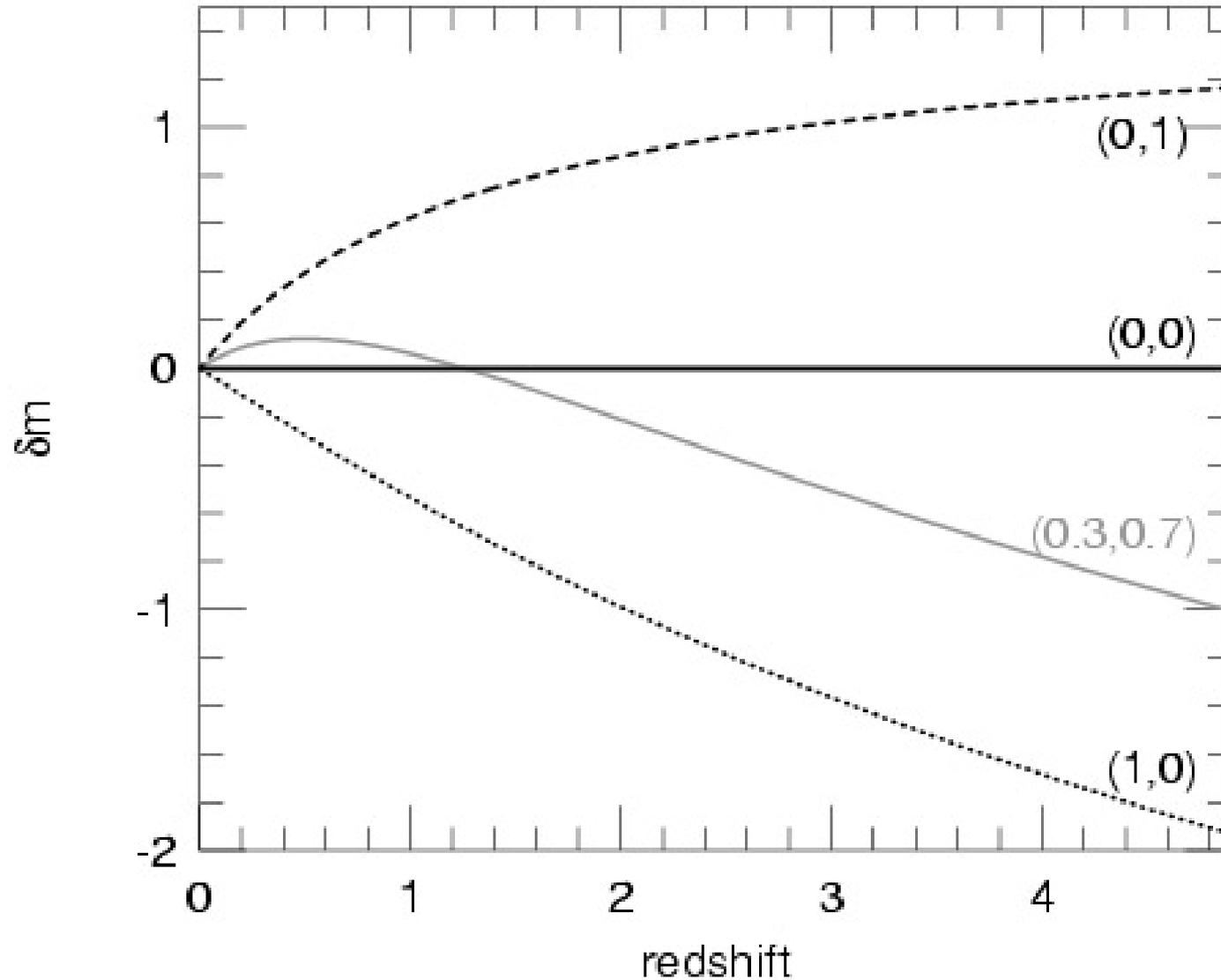
Detect Population III Supernovae

Measure the deceleration with Cepheids

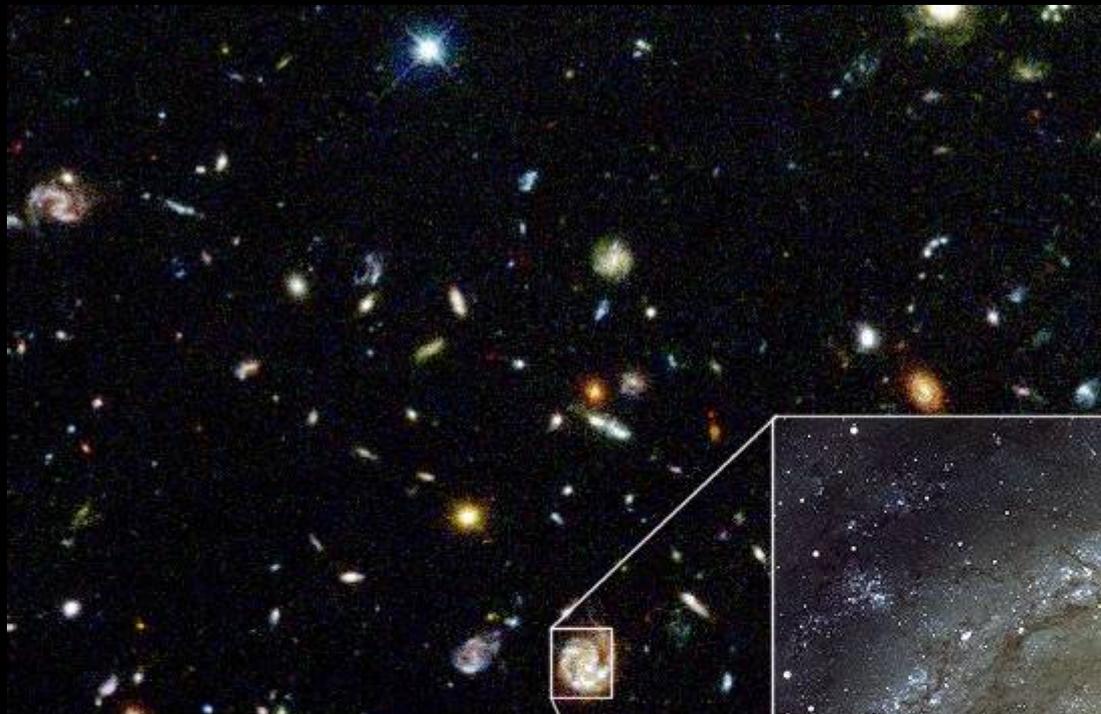
Kinematics of high- z galaxies

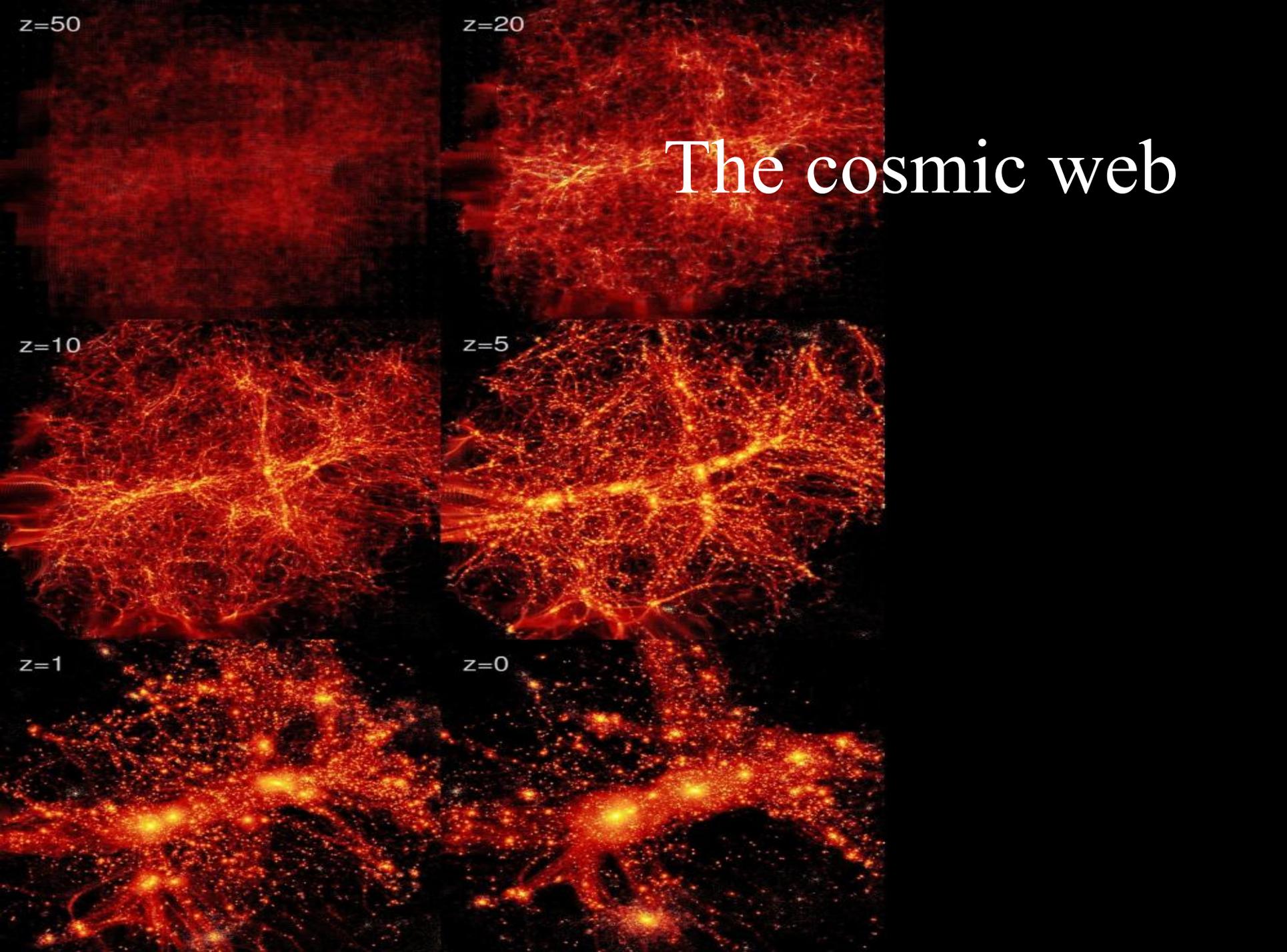
Cosmic Web through the observations of QSO
absorption lines

What else is out there?



Counting HII regions
in the far Universe





Programme of breakout session

R. Sharples	High-z emission-line galaxies
(F. Hammer	Hot topics in galaxy evolution)
J. Bergeron	Build-up of massive black holes
M. Della Valle	Supernovae
G. Ghirlanda	Cosmology with GRBs
P. Molaro	CODEx