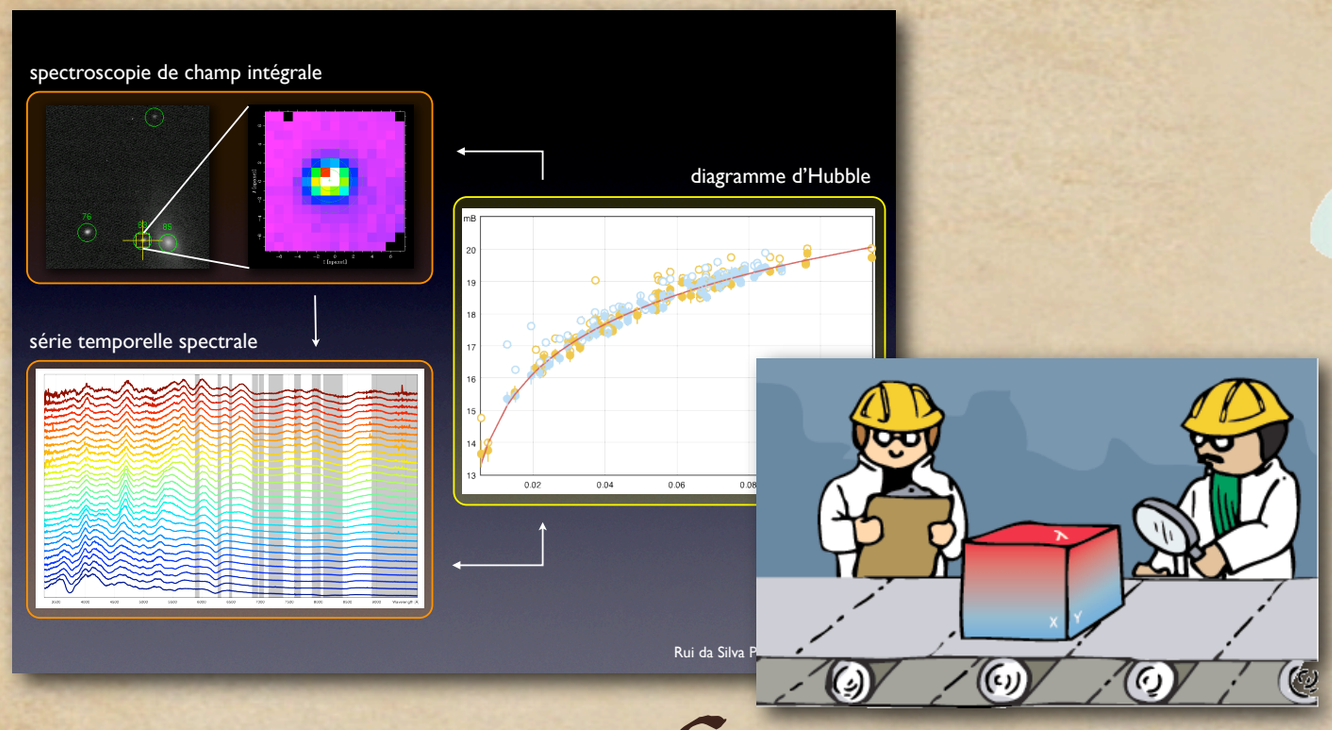
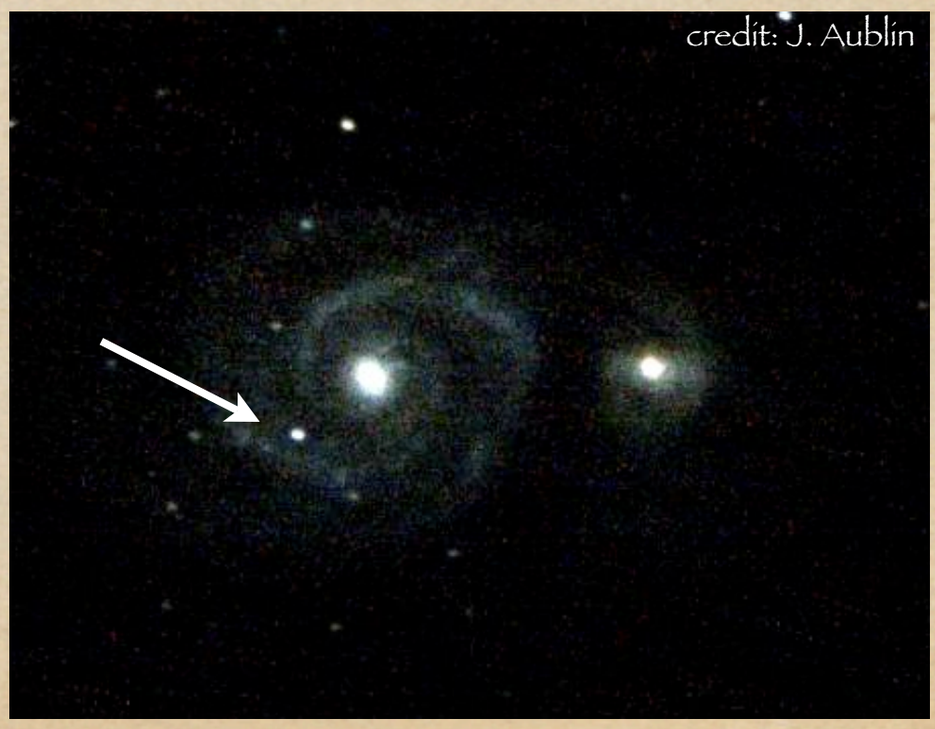
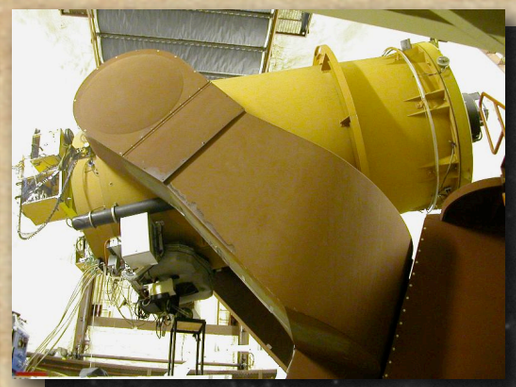
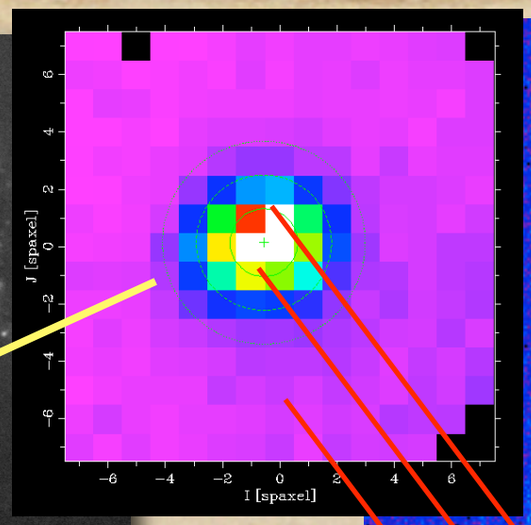


(artist's concept)

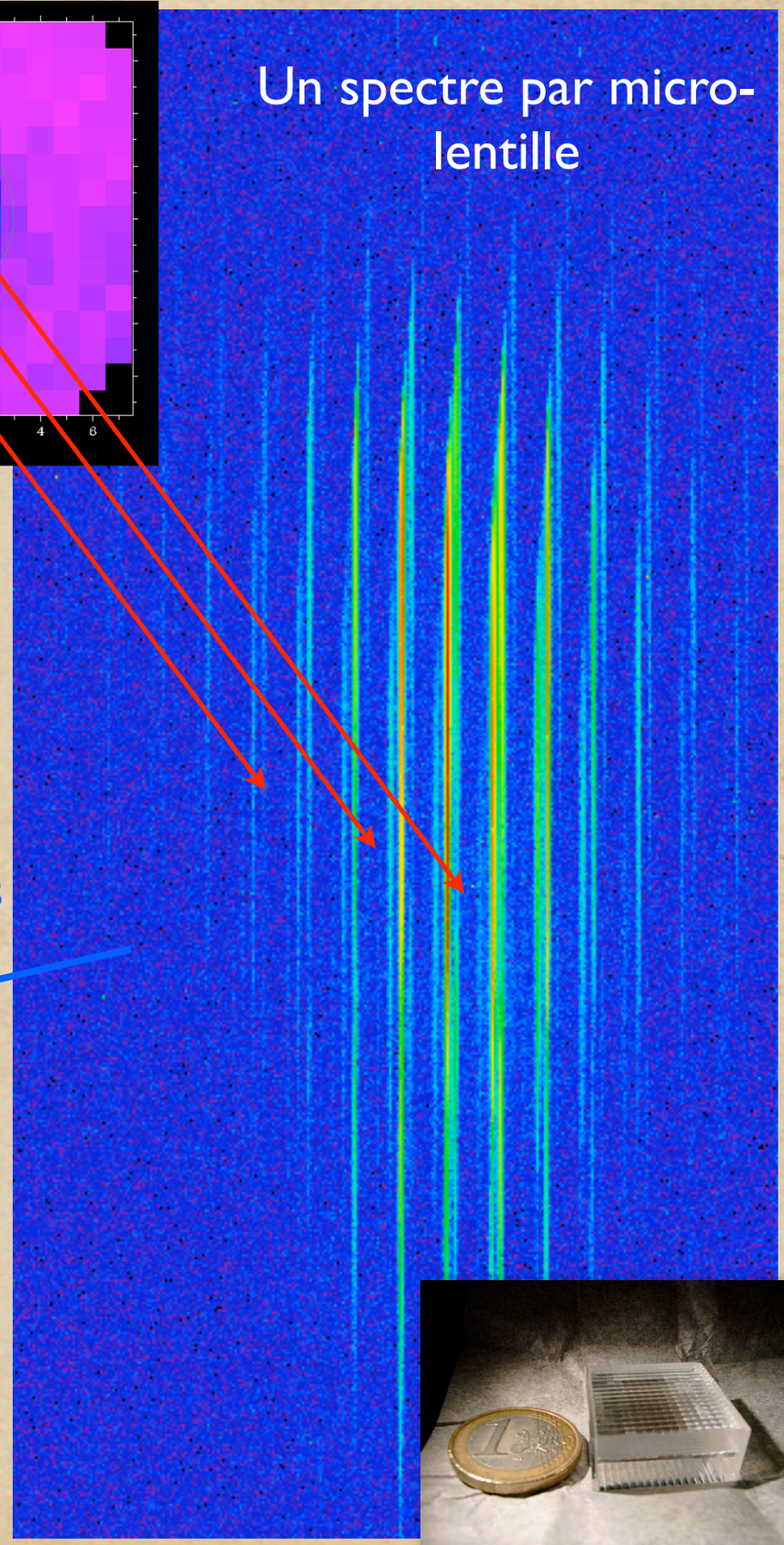
La SNfactory au LPNHE



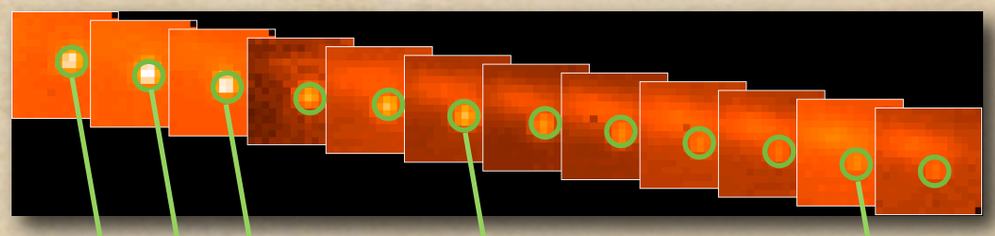


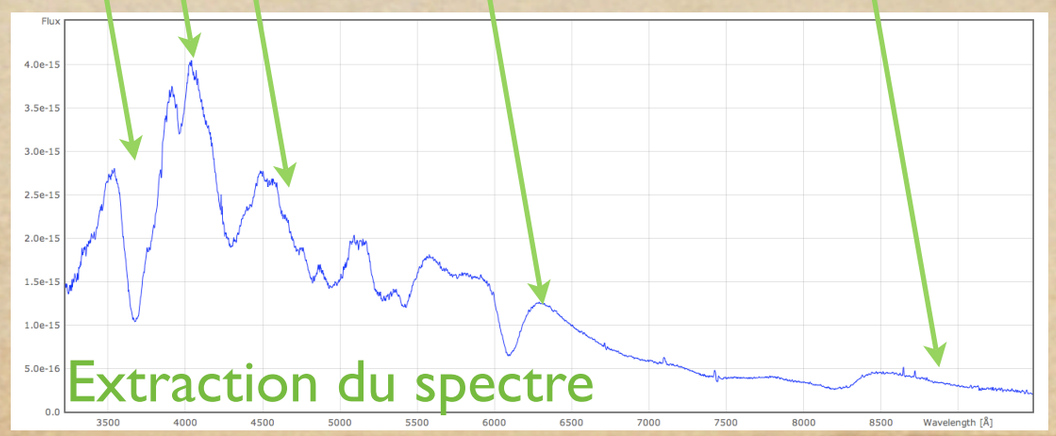


Un spectre par micro-lentille



Extraction d’un “cube” de données





Extraction du spectre

Un peu d'animation !

- En 2009, deux pannes à 6 mois d'intervalle

Intervention LPNHE/CRAL

Soutien Meca au labo: P. Repain

Réduction de données:
Soustraction de la galaxie hôte

article MNRAS 07-2011

Mon. Not.

3-D deconvolution of hyper-spectral astronomical data

S. Bongard[1]*, F. Soulez[2,3], É. Thiébaut[2], and É. Pecontal[2]
[1] *Laboratoire de Physique Nucléaire et des Hautes Energies, Université Pierre et Marie Curie Paris 6, Université Paris Diderot Paris 7, CNRS-IN2P3, 4 place Jussieu, 75252 Paris Cedex 05, France*
[2] *Université de Lyon, Lyon, F-69003, France; Université Lyon 1, Observatoire de Lyon, 9 avenue Charles André, Saint-Genis Laval, F-69230, France; CNRS, UMR 5574, Centre de Recherche Astrophysique de Lyon; Ecole Normale Supérieure de Lyon, Lyon, F-69007, France.*
[3] *Centre Commun de Quantimétrie, Université Lyon 1, 8 avenue Rockefeller, 69373 Lyon cedex 08, France.*

Accepted 2011 July 20. Received 2011 July 20; in original form 2011 March 25

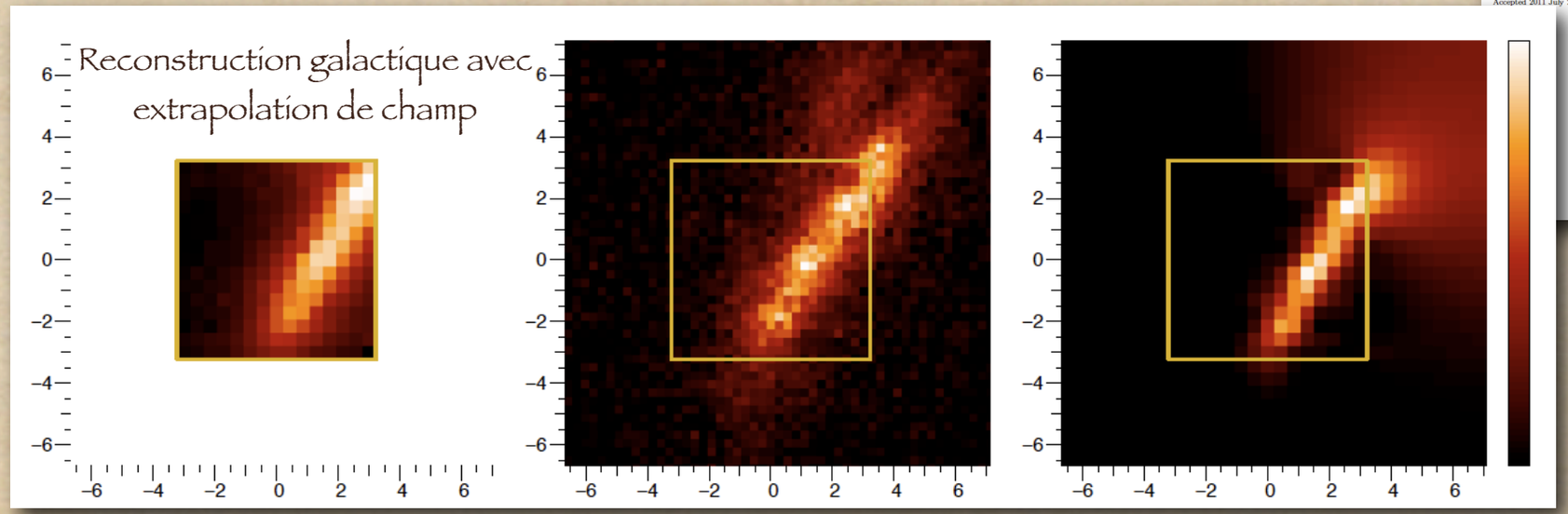
ABSTRACT

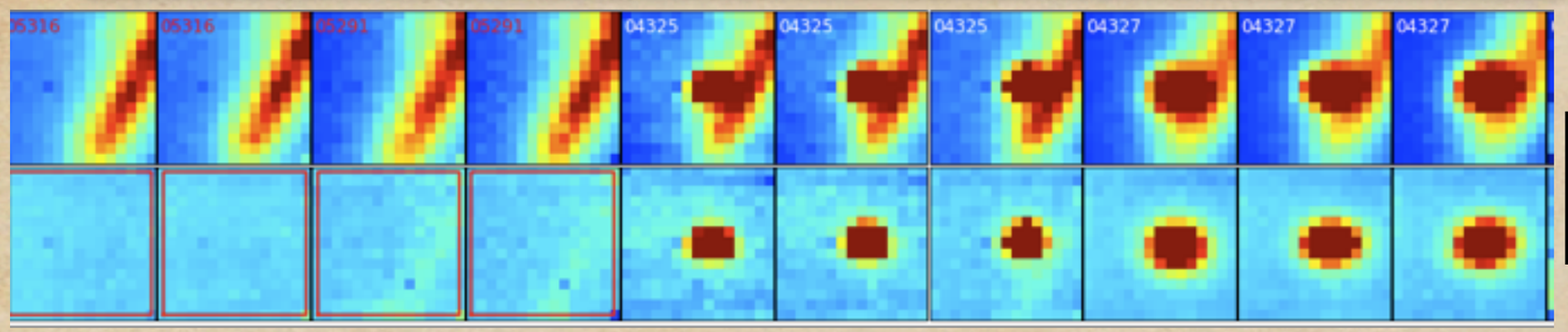
In this paper we present a general method for multichannel image restoration based on regularized χ^2. We introduce separable regularizations that account for the dynamic of the model and take advantage of the continuities present in the data, leaving only two hyper-parameters to tune.

We illustrate a practical implementation of this method in the context of host galaxy subtraction for the Nearby SuperNova factory. We show that the image restoration obtained fulfills the stringent requirements on bias and photometricity needed by this program. The reconstruction yields sub-percent integrated residuals in all the synthetic filters considered both on real and simulated data.

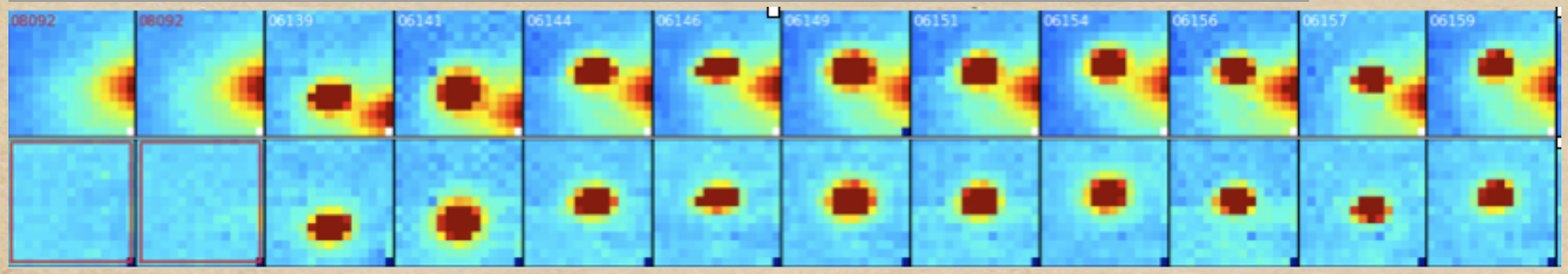
Even though our implementation is tied to the SNfactory data, the method translates to any hyper-spectral data. As such, it is of direct relevance to several new generation instruments like MUSE. Also, this technique could be applied to multi-band astronomical imaging for which image reconstruction is important, for example to increase image resolution for weak lensing surveys.

Key words: Supernova – inverse problem – deconvolution – hyperspectral imaging.





Résidus de soustraction
< 1% flux SN



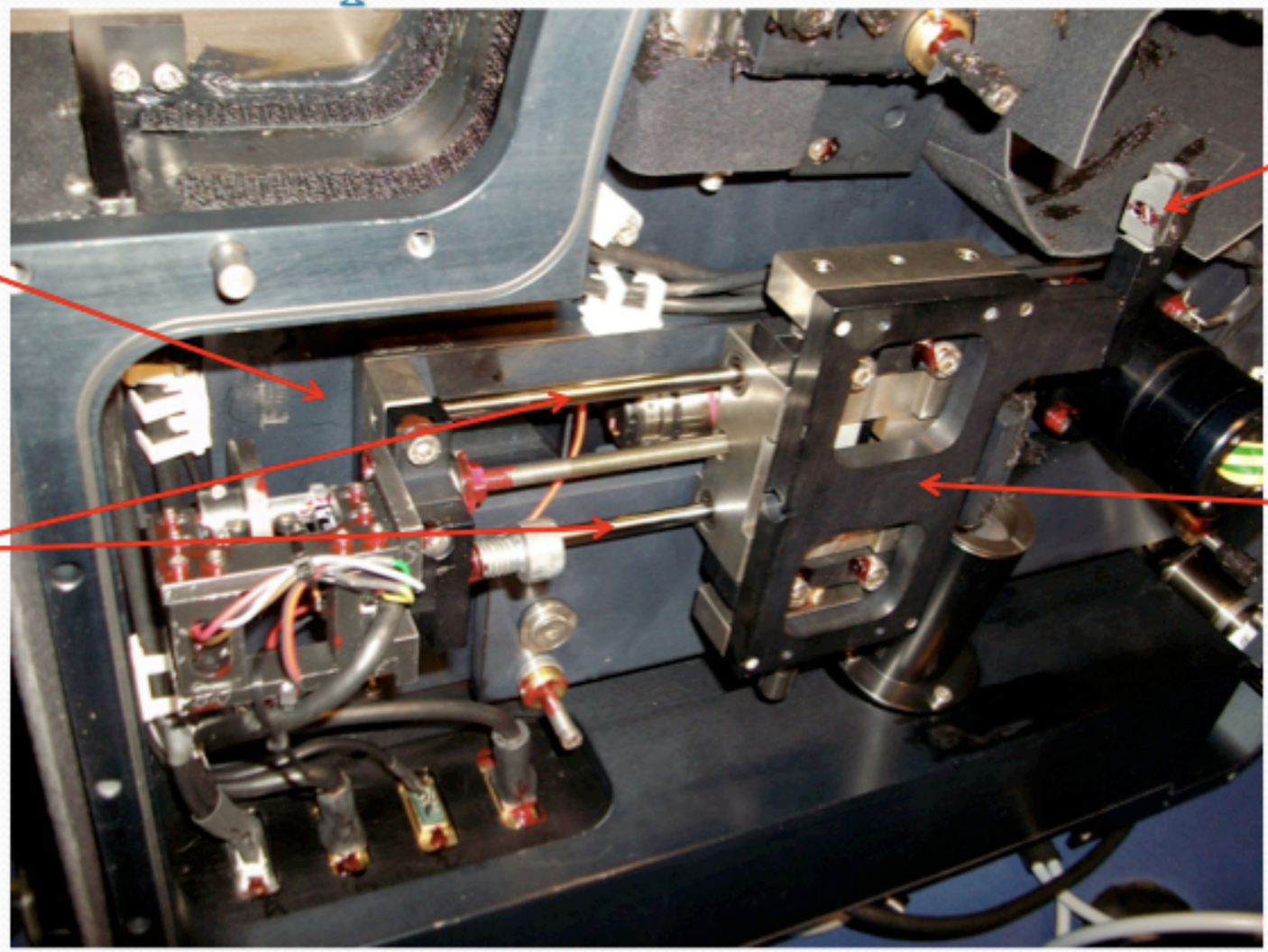
LPNHE: contribution technique majeure

Re-affinage du pointage nécessaire

Un problème de flexion détecté

LPNHE PARIS

La platine du POP

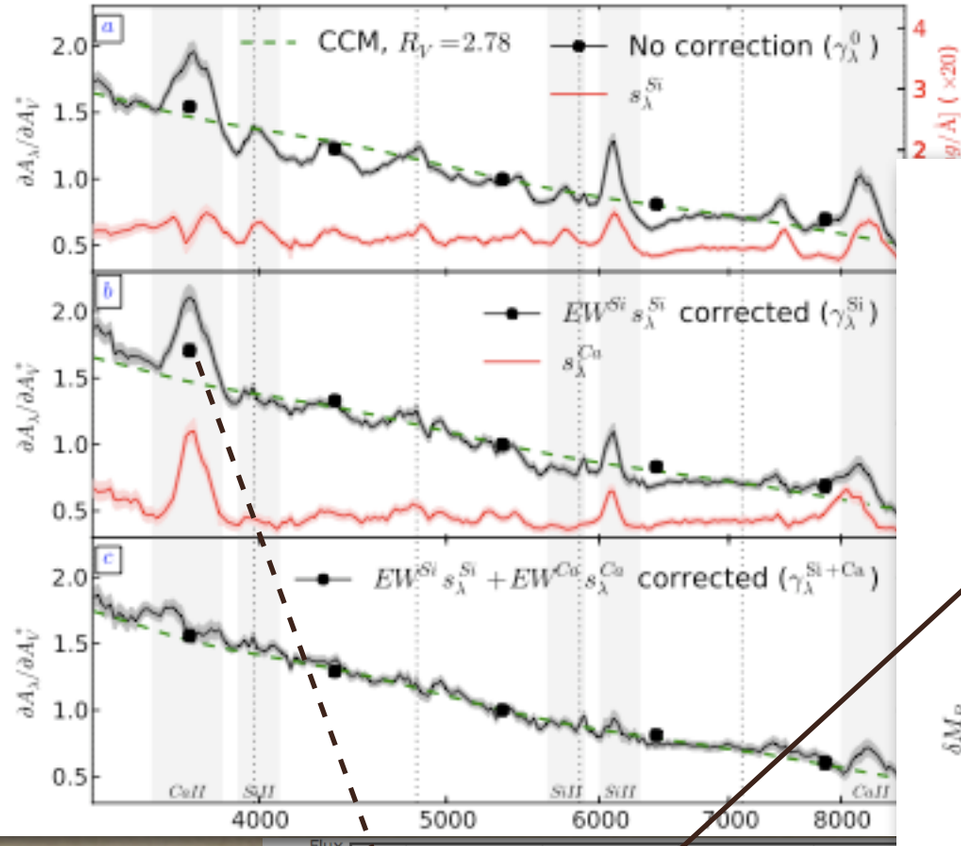


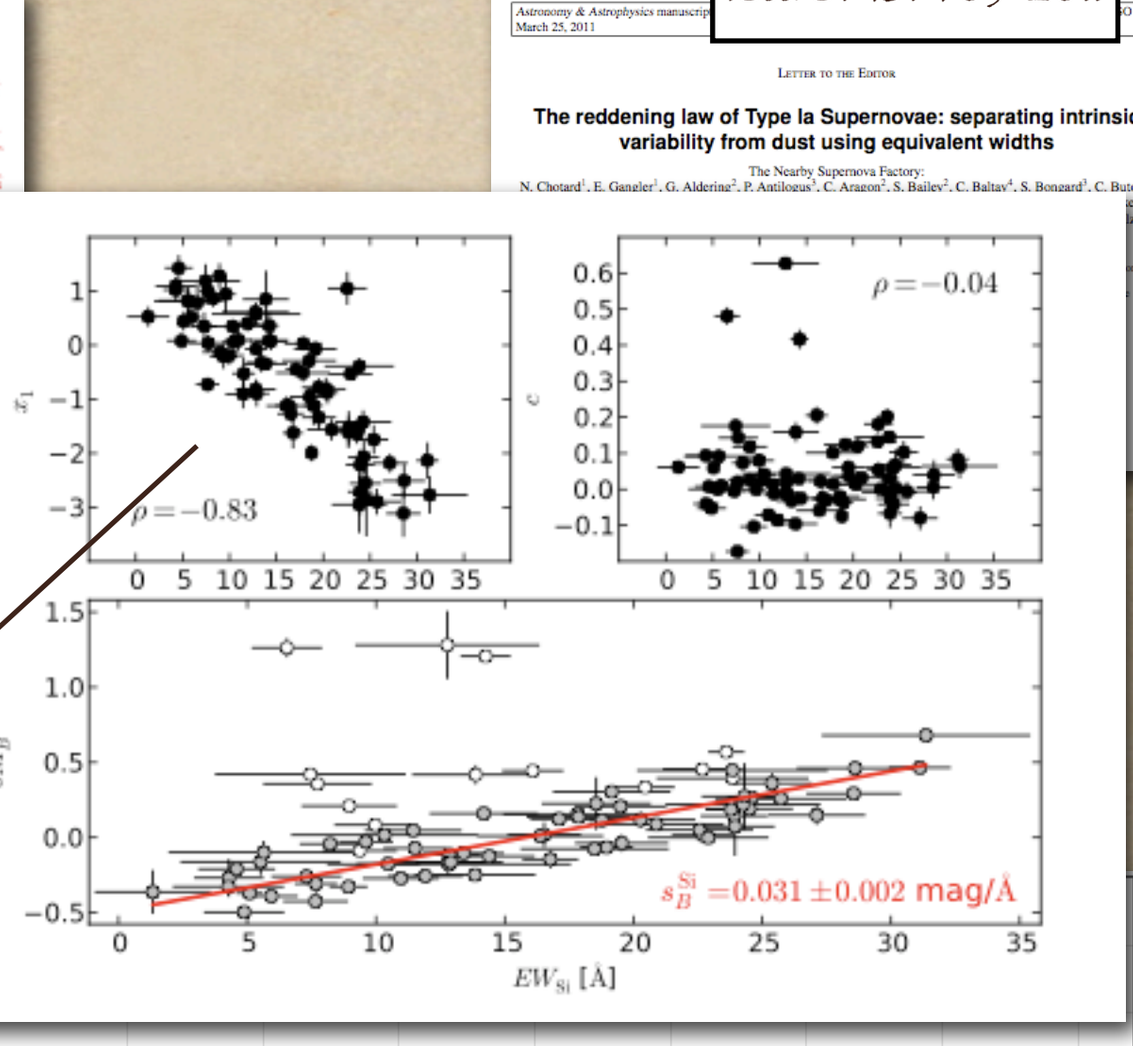
Il aurai fallu à la conception, mettre deux rails fixés sur la plaque support (auto rigidification), à la place des deux axes D8 qui fléchissent par le poids de la motorisation.

Mais non soluble en pratique: il faut apprendre à vivre avec

Couleur des SNe Ia et extinction

lettre A&A 03-2011





variabilité intrinsèque à la SN

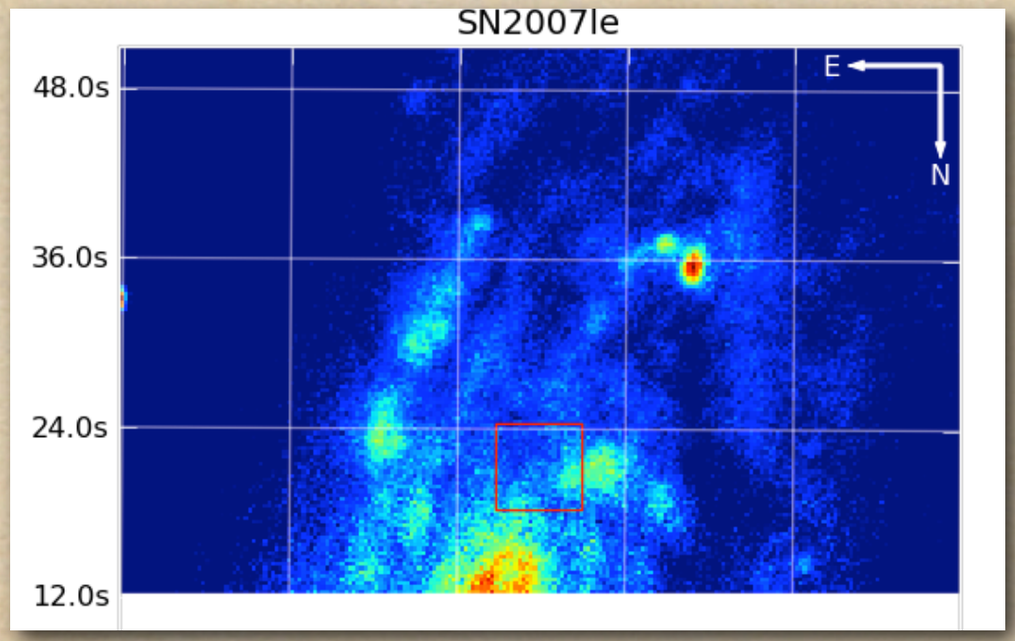
Astronomy & Astrophysics manuscript
March 25, 2011

LETTER TO THE EDITOR

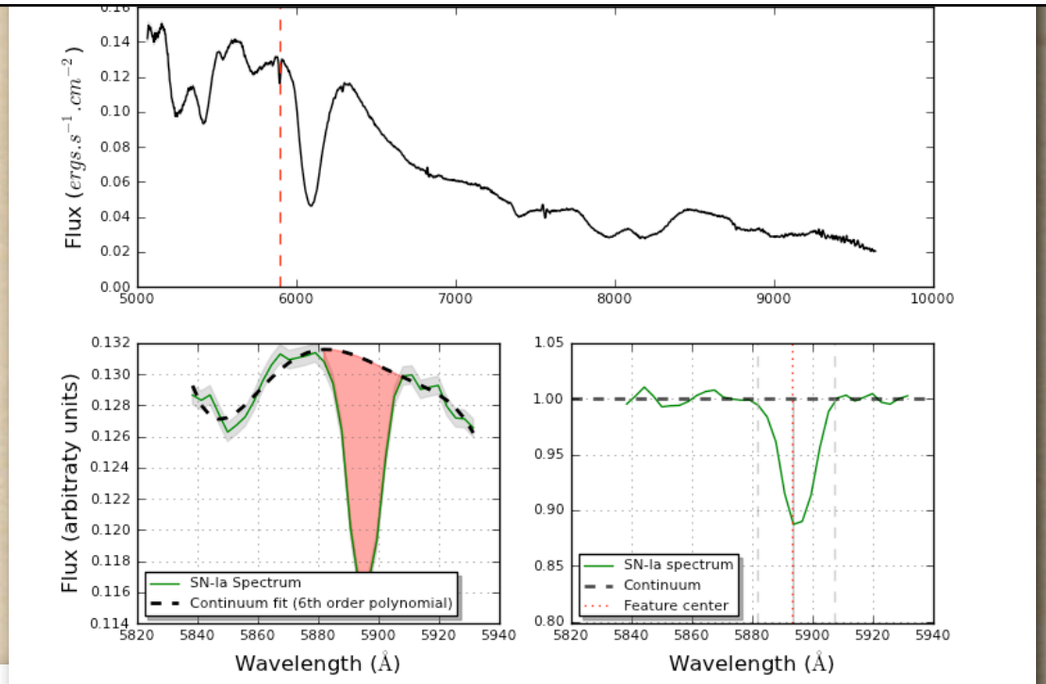
The reddening law of Type Ia Supernovae: separating intrinsic variability from dust using equivalent widths

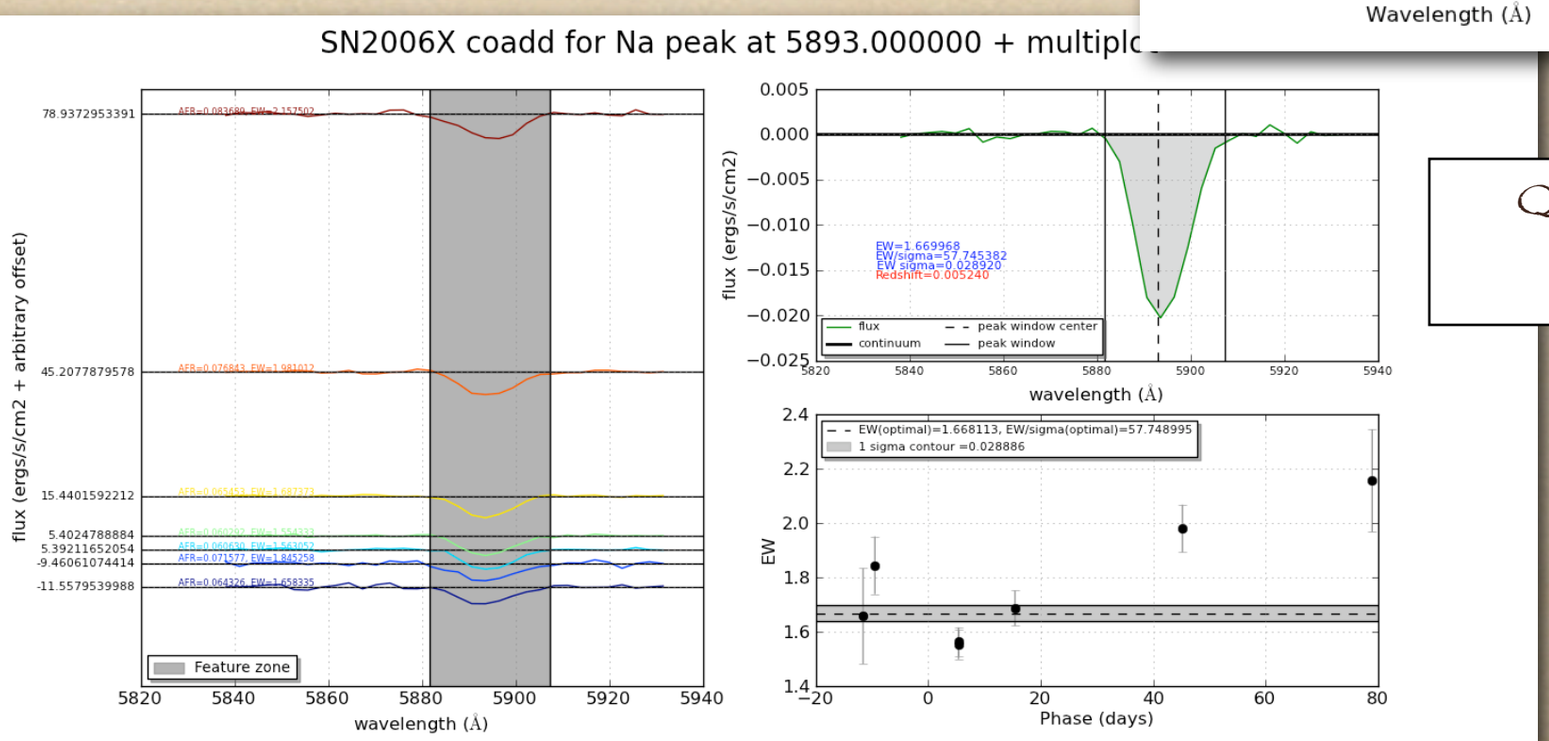
The Nearby Supernova Factory:
N. Chotard[1], E. Gangler[1], G. Aldering[2], P. Antilogus[3], C. Aragon[2], S. Bailey[2], C. Baltay[4], S. Bongard[3], C. Buton[5],

Mesure directe de la quantité de poussière



une mesure indépendente du rougissement



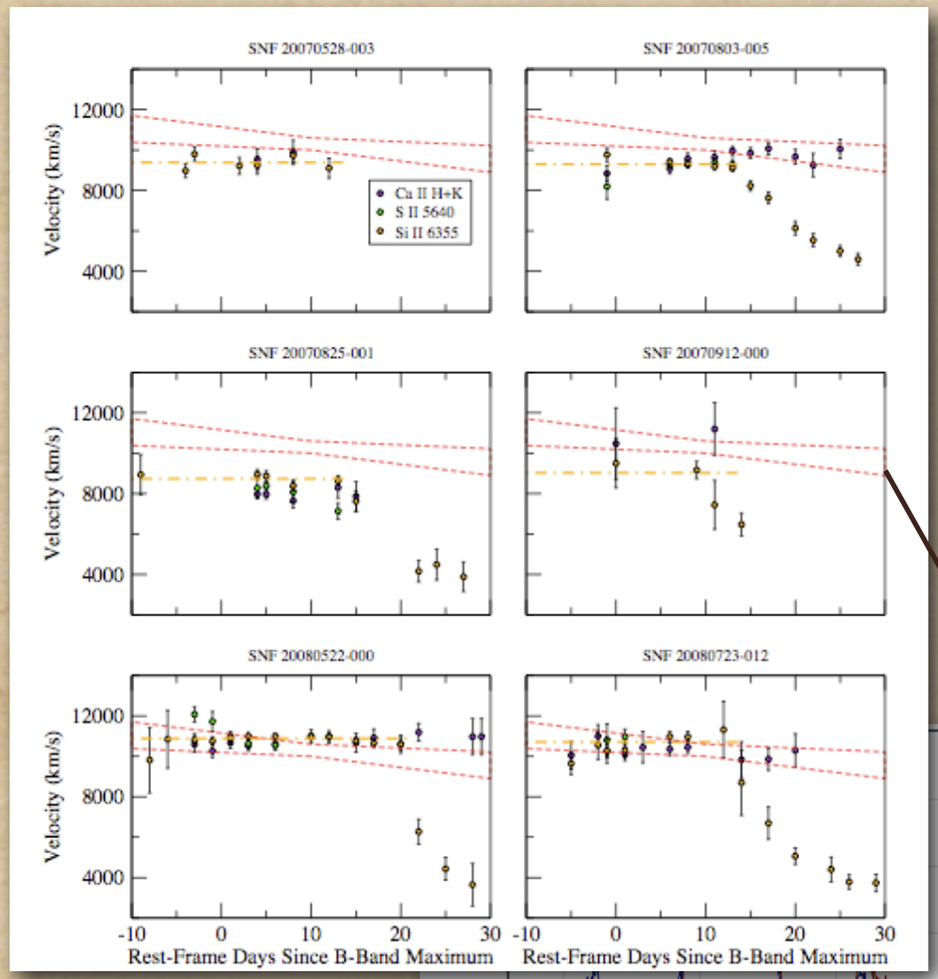


Quelques cas d'interaction directe !

⇒ Contraintes sur les progéniteurs ?

Des contraintes sur les progéniteurs

2 articles ApJ 2010/2011



NEARBY SUPERNOVA FACTORY OBSERVATIONS OF 2007if-LIKE TYPE Ia SUPERNOVAE: A CONTINUUM OF SUPER-CHANDRASEKHAR-MASS EVENTS?

R. Scalzo,[1] G. Aldering,[2] P. Antilogus,[3] C. Aragon,[2,4] S. Bailey,[2] C. Baltay,[5] S. Bongard,[3] C. Buton,[6] A. Canto,[3] F. Cellier-Holzem,[3] M. Childress,[2,7] N. Chotard,[6] Y. Copin,[6] H. K. Fakhouri,[2,7] E. Gangler,[6] J. Guy,[3] E. Y. Hsiao,[2] M. Kerschhaggl,[8] M. Kowalski,[8] S. Loken,[2,9] P. Nugent,[10] K. Paech,[8] R. Pain,[3] E. Pecontal,[11] R. Pereira,[6] S. Perlmutter,[2,7] D. Rabinowitz,[5] M. Rigault,[3] K. Runge,[2] G. Smadja,[6] C. Tao,[12,13] R. C. Thomas,[10] B. A. Weaver,[14] & C. Wu[3,15]
(The Nearby Supernova Factory)

Draft version August 30, 2011

ABSTRACT

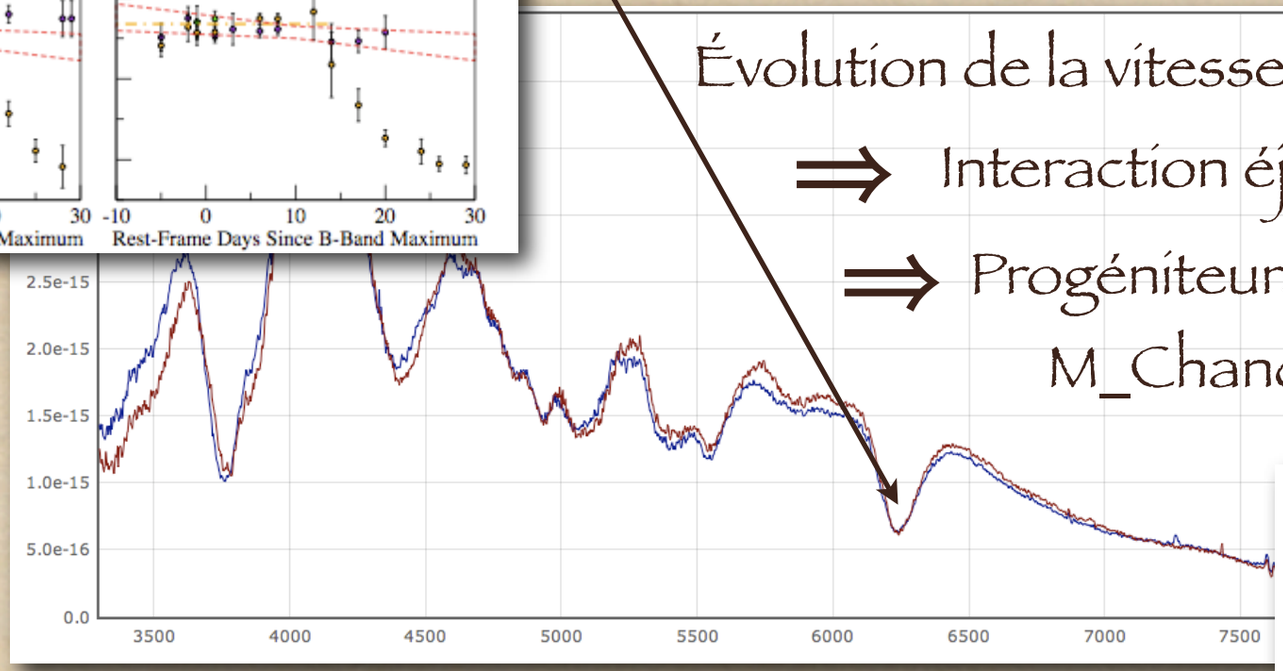
We present optical photometry and spectroscopy of five overluminous ($-19.5 < M_V < -20$) type Ia supernovae discovered by the Nearby Supernova Factory, which are spectroscopic matches to the candidate super-Chandrasekhar-mass event SN 2003fg. As in SN 2007if, the velocity of the Si II λ6355 absorption minimum in these SNe is consistent with being constant in time from phases as early as a week before, and up to two weeks after, *B*-band maximum light. We interpret the velocity plateau as evidence for a reverse-shock shell in the ejecta formed by interaction at early times with a compact envelope of surrounding material, as might be expected for SNe resulting from the mergers of two white dwarfs. We use the bolometric light curves and line velocity evolution of these SNe to estimate various parameters of the progenitor systems, including ^{56}Ni mass, total progenitor mass, and masses of shells and surrounding carbon/oxygen envelopes. We find that the reconstructed total progenitor mass distribution of the events (including SN 2007if) is bounded from below by the Chandrasekhar mass, with SN 2007if being the most massive. We discuss the relationship of these events to the classical 1991T-like SNe Ia and to the emerging class of super-Chandrasekhar-mass SNe Ia, compare the mass distribution to that expected for double-degenerate SN Ia progenitors from population synthesis, and consider implications for future cosmological Hubble diagrams.

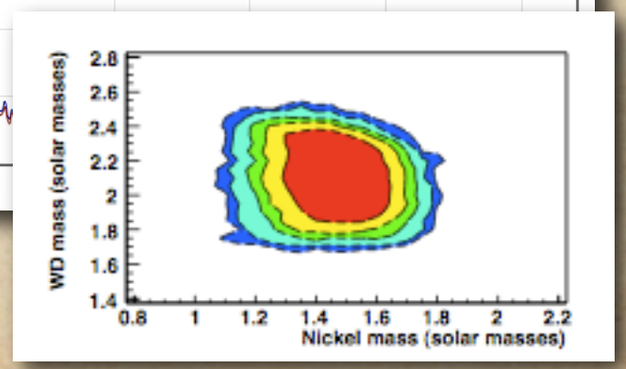
Subject headings: white dwarfs; supernovae: general; supernovae: individual (SN 2003fg, SN 2007if, SN 2009dc, SNF 20080723-012)

Évolution de la vitesse du Si II

⇒ Interaction éjectat/enveloppe

⇒ Progéniteurs de Masse > M_Chandrasekhar





Système double-dégénéré ?

Des contraintes sur les progéniteurs

Articles ApJ 08 2011

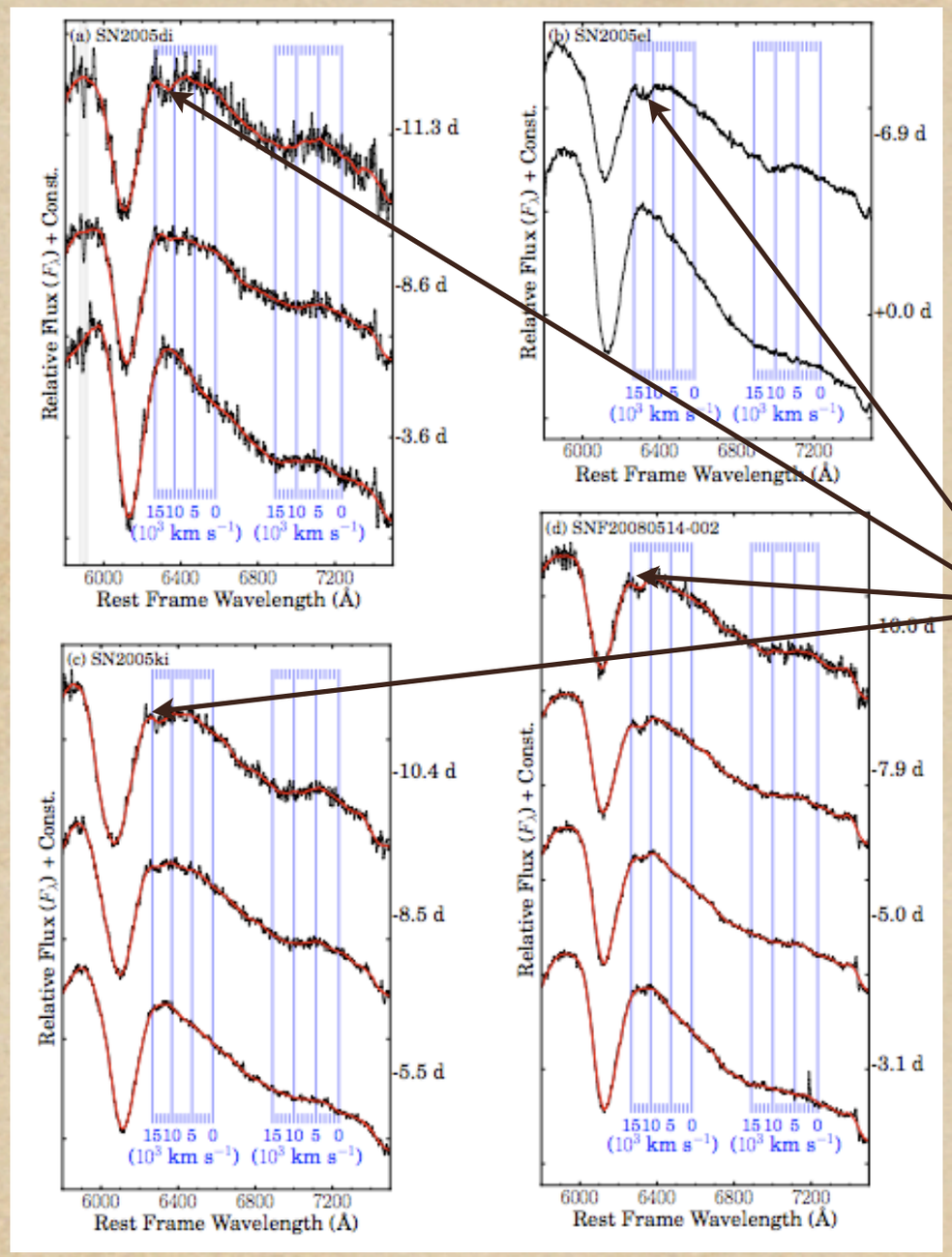
R. C. Thomas,[1] G. Aldering,[2] C. Aragon,[2] P. Antilogus,[3] S. Bailey,[2] C. Baltay,[4] S. Bongard,[3] C. Buton,[5] A. Canto,[3] M. Childress,[2,6] N. Chotard,[7] Y. Copin,[7] H. K. Fakhouri,[2,6] E. Gangler,[7] E. Y. Hsiao,[2] M. Kerschhaggl,[5] M. Kowalski,[5] S. Loken,[2,*] P. Nugent,[1] K. Paech,[5] R. Pain,[3] E. Pecontal,[8] R. Pereira,[7] S. Perlmutter,[2,6] D. Rabinowitz,[4] M. Rigault,[7] D. Rubin,[2,6] K. Runge,[2] R. Scalzo,[9,10] G. Smadja,[7] C. Tao,[11,12] B. A. Weaver,[13] C. Wu[14] (The Nearby Supernova Factory); P. J. Brown,[15] & P. A. Milne[16]

Draft version August 5, 2011

ABSTRACT

We present convincing evidence of unburned carbon at photospheric velocities in 5 Type Ia supernovae (SNe Ia) observed by the Nearby Supernova Factory. These SNe are identified by examining 346 spectra from 124 SNe obtained before +2.5 d relative to maximum. Detections are based on the presence of relatively strong C II λ6580 absorption "notches" in multiple spectra of each SN, added by automated fitting with the SYNAPPS code. Four of the 5 SNe in question are otherwise spectroscopically unremarkable, with ions and ejection velocities typical of SNe Ia, but spectra of the fifth exhibits high-velocity ($v > 20{,}000$ km s^{-1}) Si II and Ca II features. On the other hand, the light curve properties are preferentially grouped, strongly suggesting a connection between carbon-positivity and broad band light curve/color behavior: Three of the 5 have relatively fast-evolving light curves but also blue colors, and a fourth may be a dust-reddened member of this family. Accounting for signal-to-noise and phase, we estimate that 22^{+10}_{-6}% of SNe Ia exhibit spectroscopic C II signatures as late as −5 d with respect to maximum. We place these new objects in the context of previously recognized carbon-positive SNe Ia, and consider reasonable scenarios seeking to explain a physical connection between light curve properties and the presence of photospheric carbon. We also examine the detailed evolution of the detected carbon signatures and the surrounding wavelength regions to shed light on the distribution of carbon in the ejecta. Our ability to reconstruct the C II λ6580 feature in detail under the assumption of purely spherical symmetry casts doubt on a "carbon blobs" hypothesis, but does not rule out all asymmetric models. A low volume filling factor for carbon, combined with line-of-sight effects, seems unlikely to explain the scarcity of detected carbon in SNe Ia by itself.

Subject headings: supernovae: general — supernovae: individual (SN 2005cf, SN 2005di, SN 2005el, SN 2005ki, SNF20080514-002)



Du carbone dans le spectre

SNe bleues et à déclin rapide

Une sous classe de détonation retardée ?

De l'armée mexicaine au Cid ?

2008:

R. Pain + P. Antilogus au board

P. Repain soutien technique

S. Bongard Analyse/reduction

2009-2011:

Contribution majeure du LPNHE à la réduction de données

Des premières analyses importantes publiées

De l'armée mexicaine au Cid ?

2011 & Futur

R. Pain + P. Antilogus au board

P. Repain

S. Bongard
A. Canto
F. Cellier-Holzem
J. Guy
C. Balland

Soutien technique minimal

Diminution des contributions
"reduction de données"

Et par un prompt renfort...

Une re-orientation forte vers l'analyse